1 Gonstead Radiography

2 What about the risks of ionizing radiation?

- Definite consideration
  - This must be considered when you are selecting an appropriate XR exam
    - what are the potential side effects
  - Remember: the consequences are cumulative
    - so we need to attempt to reduce exposure
    - there are several things that do this

3 What are the effects?

- Somatic effects…
  - two types…
    - local
    - general

4 Local effects…

- Very rare…
  - These occurred early in the use of X-ray
    - the result of
      - multiple exposures
      - experiments
  - These effects have decreased with the improvement in systems and the decrease in patient exposure

5 General Effects...

- Effecting the system… some examples
  - There is a doubled incidence of leukemia in children whose mothers underwent Roentgen Pelvimetry during pregnancy
  - May see increased cancer of the thyroid in patients who received therapeutic thymus radiation during infancy

6 The upshot is:

- Yes, you need to be aware of the risks
- If you need an X-ray, take an X-ray
  - Todays systems reduce exposure substantially
- Let me show you what I mean

7 Who's around radiation the most?

- Probably Rad Techs…
  - There's no evidence to suggest that RT's have a decreased life span due to their exposure…
    - Of course, they're always hiding behind a lead wall…. Hmmm...

8 Genetic Effects

- Genetic effects of radiation exposure are cumulative
  - i.e. a 100 Rad dose has the same genetic effect if you receive it over 1 minute or

over a year…

9 ## Interesting Statistic

- Total dose of 30 to 80 rad to the gonads of the entire population would result in a doubling of genetic mutations
- any volunteers?

10 ## Total dosage allowed…

- National Academy of Sciences - Committee on Radiation suggests
  - no more than 10 Rad total exposure before the age of 30
  - this excludes natural sources

11 ## What does that mean?

- It is important to use gonadal shielding when possible
- EXCEPT:
  - when the shielding would cover a suspected abnormality
  - (I.e. it covers what you are trying to look at)

12 ## To put it into perspective

- 1988 conference on Radiation Control Program Directors set guidelines for studies performed

13 ## The studies allowed:

- AP Full spine with 400 speed system
  - approximately 145 mR
  - Gonadal dose of that is about 20% or 30 mR

14 ## Therefore

- a 30 year old man would have to have at least 333 AP full spine studies before the guidelines are met
- Using a 1200 speed system with shielding
  - number increases to >1000 APFS studies to exceed guidelines for safety
- The risk is minimal

15 ## National Council on Radiation Protection

- suggests and individual can have 34 APFS studies with a 400 speed system
- that's 2 per year for 17 years… the few we will do probably won't make a dent in the patient genetically speaking…
  - (assuming you're an ethical doctor…)

16 ## Anti Oxidants

- There are some studies that suggest the use of Anti-Oxidants can decrease the risk to low dosage irradation
  - be careful… not just any anti-oxidant will do. One study from MD Anderson hospital suggests that most commercial anti-oxidant formulations actually produce more free radicals than they eliminate -

17 ## In the Gonstead system

- We use 14" x 36" A-P and Lateral views
- Gonstead felt:
  - "If you can't see the whole man, you can't treat the whole man"

18 ## A few points about X-ray…

- 1932
  - Sausser - a chiropractor
    - First to use 14 x 36 film
    - He eventually used a 14 x 72 film for the whole body
- BJ Palmer
  - Brought the first XR unit west of the Mississippi
  - He claimed that 64% of palpatory findings were in error when compared to x-ray findings… hmm
    - Maybe we should do like Dr. Gonstead said and use both when possible??

19 ## Gonstead…

- Developed an analysis system
  - a systematic method for analyzing the XR
  - Dependent on strict patient patient positioning
    - a bit different than what you will be learning here…
  - Takes advantage of distortions
    - Understand how bony position changes alter the image

20 ## Shielding

21 ## Filtration

- Niobium filter reduces scatter
- Pre-patient filtration for homogenous screen system

22 ## Split Screens vs. Homogenous screens

23 ## Isolating landmarks

- tape BB's to vertebra prominens (lateral view)
  - can also tape to:
    - scars
    - moles
    - areas of clinical findings (i.e. heat findings)
  - They can obscure pathologies… be careful

24 ## Your x-ray should

- focus on information that will determine treatment

25 ## Weight-bearing vs. Recumbent

26 ## Full Spine Films:

- problems:some say there is:
  - Distortion (minimal from segment to segment for biomechanical comparison)
  - increased patient exposure
    - limited with faster systems and better technique
  - difficulty producing quality films

- true for any format if done incorrectly
- good technique makes good films

27 Study by the Diplomates of the American Chiropractic College of Roentgenology
- 1980 study
- essentially found that although there may be a slight decrease in image quality
- Diagnostic value of full spine radiographs appears to be equal to sectionals
  - ACA Journal of Chiropractic, July, 1980 Vol 14, pp S-80-87

28 Value of full spine xrays?
- A-P view gives a view of the entire spine at once.
  - One can see distant effects of local problems
    - if you only saw an 8x10 section of curve, you might miss the problem itself
  - The best way to determine the number of spinal segments

29 FFD for full spines…
- 84"
  - X-Ray beams more parallel
  - reduces distortion
  - reduces magnification
  - increases film quality

30 Angles of Incidence

31 Positioning
- Specific positioning is the key to repeatable films
- If you are going to do pre and post treatment exposures, this is especially important

32 Measurements - AP film
- At Mount Horeb they measure the chest and the largest part of the abdomen
- these are averaged and a number produced called the Centimeter Thickness
  - This will be used on a chart to determine the MaS
- The patient's weight is compared to another chart
  - this will determine the KVP

33 Patient Positioning - AP film
- The patient lines up at the center of the bucky
- heels in normal foot flare, but parallel to the bucky
- The patient shuffles backward until something touches the bucky

34 Positioning - AP film
- Dr. checks to be sure patient is centered on bucky
- Patient should not be leaning against the bucky, or to either side
- Natural foot flare should be maintained
- Patient should wear shoes that they wear everyday
  - new shoes are exceptions - not worn in yet
- any heel lifts should be left in

35 Positioning - AP film

- Patient opens mouth and places head in a position to allow the occiput/mandible/teeth to not obscure the upper cervical area
- High tech string device is helpful
- Patient's head rotation due to joint dysfunction should be maintained
- Patient exhales and holds for the exposure

36 ☐ Patient positioning - Lateral film

- This is basically 2 14 x 18 films on a 14 x 36 sheet

37 ☐ Measurements - Lateral

- at widest point of shoulders, and at the trochanters
- can use these values for exposure charts

38 ☐ Patient placement - Lateral

- shoulders perpendicular to bucky, lightly touching it
- heels perpendicular to beam, parallel to bucky
- Lumbar spine centered to bucky
- eyes excluded
  - collimation
  - cool shades
  - shields

39 ☐ Why 2 exposures?

- Minimized distortion
  - beams more parallel to disk planes
- Better visualizes the disk spaces
  - see above
- Helps visualize the entire spine
- helps with storage (both films the same size)

40 ☐ Film shift

- Simply shooting the upper and lower films leaves a 3" gap in the spine
- you must have a film shift:
  - expose the upper half of the film, shift the bucky up
    - traditionally it is a 4" shift… I'll show you something else in a second…
  - align the tube to the lower half and make the second exposure

41 ☐ 4" is probably too much

- Still causes a double exposure
- Better way (a bit more time consuming)
  - Trigonometric chart

42 ☐ Trigonometric chart for film shift

- Table 5.4 in Plaugher
- measure from T10 to film
- Examples:

Measurement	Film Shift
8"	1.5"

- 9″ 1.75″
- 10″ 2″
- 11″ 2.25″
- 12″ 2.5″

43 ☐ Can it be done in a single exposure?

- Yes… FFD should be at least 90″
  - decreases distortion
- Problem… it increases you exposure and the stress on the tube

44 ☐ Film Storage Device

- Rolling Rack (Rholer Rack)
  - Holds up to 1000 films
  - 750-850 allows easier access to films

45 ☐ Another Option

- Wall Rack

46 ☐ Devices for alignment

- Foot placement device
  - most important parts are the lines that are
    - perpendicular to the bucky
    - parallel to the bucky
- Footprints tend to make patient alter normal foot flare, and are therefore probably undesirable

47 ☐ Arm support devices

- Three types of arm support devices
  - A. adjustable rail attached near bucky (my favorite)
    - Patient is stable during film shift
    - reduces weight being held by patient - important if they have arm or low back pain
  - B. Long dowel - good in a pinch but allows patient movement during film shift
  - C. Long dowel - Swimmer's view

48 ☐ Spot films

49 ☐ Stress films

- Static films limit the assessment of the final status of the motion unit
- can help distinguish between a fixation and a hypermobile segment
  - can see the abnormal increase or decrease in motion
    - (increase, decrease or paradoxical motions)

50 ☐ Stress views:

- Should be taken at the same FFD as the statics for comparison

51 ☐ What views can we do?

- Lumbar
  - AP Lateral flexion
  - Lateral flexion/extension
- Thoracic
  - Lateral flexion
  - rotation
- Cervical Spin
  - lateral flexion
  - flexion/extension
  - atlas lateral flexion and rotation