The Alliance for Radiation Safety in Pediatric Imaging

Image Gently

Fluoroscopy

Marta Hernanz-Schulman MD, FAAP, FACR
Professor, Radiology and Pediatrics
Vanderbilt University Medical Center
Vanderbilt Children’s Hospital
Steering Committee: Alliance for Radiation Safety in Pediatric Imaging
The Alliance for Radiation Safety in Pediatric Imaging

- Interventional Radiology
- Fluoroscopy
- CR-DR
- Nuclear Medicine

Step Lightly
Pause & Pulse
BACK TO BASICS

Go with the Guidelines!
Committee Members

- Eileen Ahlswede, RTR, FASRT
- Ishtiak H. Bercha MSc
- Jennifer K. Boylan MA
- Michael J. Callahan MD
- Susan D. John MD
- Marilyn J. Goske MD
- Sue C. Kaste MD
- Ceela McElveny, ELS, CAE
- Beverly Newman MD, FACR
- Keith J. Strauss MS
- Valerie L. Ward MD
- Daniel W. Young MD
Fluoroscopy
Approximately 5,000 fluoroscopies annually
- Maximum 17,000 (SCORCH survey, 2007)

Dose regulations
- "Normal mode": 10R/min exposure rate
- "High dose": 20R/min (audible tone emitted)
- "5 minute" reminder

- No regulations on mode of operation, time, dose

- Privilege programs: training in radiation protection
Fluoroscopic procedures help us save kids’ lives!

Pause and child-size technique
Use the lowest pulse rate possible
Consider ultrasound or MRI when possible
Pulsed fluoroscopy

RATIONALE:

- Pulsing the X-ray will decrease exposure time
- Decrease radiation dose
Voltage to the X-ray tube is switched on and off at the generator, at a given pulse rate: kVp pulsed fluoro

- leads to a ramp-up and trail-down of the pulses
- Based on the capacitance of the cable from generator to tube
- Ramp-and-trail effect increases non-diagnostic radiation, without substantially reducing overall dose
Negatively charged grid is interposed between cathode and anode.

Grid can be rapidly switched on and off, intermittently stopping the electron flow.

Results in true pulsed fluoroscopy.
Grid-controlled fluoroscopy eliminates the ramp-and-trail effect

- Diminished radiation dose
- Sharper image
30 pulses or frames per second is flicker-free to the human eye.

Continuous fluoroscopy is typically depicted at 30 frames per second.
What is the difference?

- Continuous fluoroscopy
  - 30 pulses per second
  - 33 msec pulse width

- Grid-controlled fluoroscopy (e.g.)
  - e.g. 15 pulses / sec
  - 20 msec pulse width
Effect on moving objects

Continuous fluoroscopy
- blurring of rapidly moving objects
- function of longer pulse width

Pulsed fluoroscopy
- flicker effect
- pulse rates < 15/sec
Grid-controlled fluoroscopy

What is the effect on image quality?

- 2 p/sec
- 8 p/sec
- continuous

✓ 33% more moving objects seen with pulsed than with continuous fluoroscopy

Grid-controlled fluoroscopy

Continuous fluoroscopy

15 pulses per second
Grid-controlled fluoroscopy

Frame during motion

Continuous fluoroscopy

15 pps
Still images: exposure vs grab

Fluoro-grab

Exposure
Fluoro – Grab: “moving” images
7.5pps no grid vs. continuous with grid
- 1 year old: $649/126 = 80\%$ reduction
- 10 year old: $3,250/425 = 87\%$ reduction
Publications

- Pause and Pulse: ten steps that help manage radiation dose during pediatric fluoroscopy AJR 2011;197(2) 475-481
- Fluoroscopic Procedures in Children Radiol Technol 2011;82(3):271-273

Parent brochures

- Contrast enema
- UGI
- VCUG
Parent FAQ’s

- What is medical radiation assessing hospital and need for the study

Checklists

- for technologists
- for physicians

Educational Modules

- Sections I-III

Power Point presentation

http://imagegently.org/Procedures/Fluoroscopy.aspx
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Thank you