Low-Radiation, High-Resolution Diagnostics for a Vulnerable Population: Analyzing Research on Photon-Counting CT in Pediatric Abdominal Imaging

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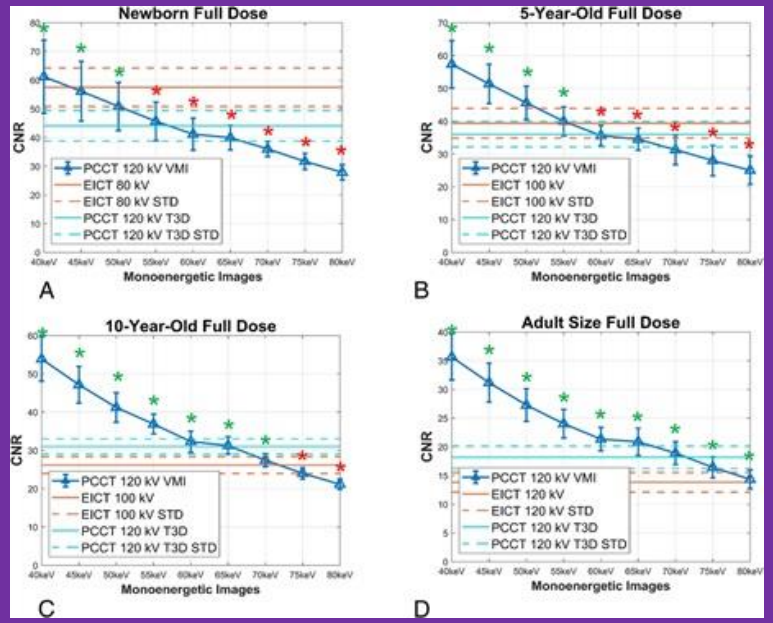
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Purpose/objective

- Photon-counting computed tomography (PCCT) directly converts X-ray photons into electrical signals
  - Enhances spatial resolution
  - Reduces radiation dose
- Association between radiation exposure and malignancy is particularly remarkable in pediatrics
- Purpose: Call for **more robust original research on the use of PCCT in pediatric abdominal imaging** to reduce radiation exposure and improve diagnostic accuracy

Results

- N = 1 original research study that has analyzed the use of PCCT in pediatric abdominal imaging
- 2024 study found that a universal 120-kV PCCT protocol in pediatric abdominal imaging can provide:
  1. **Superior image quality**
  2. **Improved contrast-to-noise** ratio regardless of patient size [1]
  3. **Lower noise**
  4. Significantly **reduced radiation**



PCCT VMI at 50 keV or lower shows significantly higher or comparable iodine contrast-to-noise ratio compared to EICT across all phantom sizes and dose levels [1]

Methods

- 3 data bases: PubMed, Google Scholar, and ScienceDirect
  - Base search: “pediatric photon counting CT abdominal,”
  - Phrase additions: “abdomen,” “IBD,” “kidney,” “renal,” “bladder,” “PCCT,” “PCD-CT”

Inclusion criteria

- Study type: randomized and controlled clinical trials, prospective and retrospective cohort studies, or case series
- Published in the last decade
- Analyzing use of PCCT in pediatric abdominal imaging

Exclusion criteria

- Did not study pediatric patients
- Did not use PCCT

Discussion

- Original research on PCCT for pediatric abdominal radiology is currently scarce
  - There exist many original research studies for PCCT in adults
- It is essential that this technology is further researched in the **pediatric population**, as it:
  - **Reduces long-term risks** of radiation exposure
  - **Improves image resolution** and dose efficiency

[1] Zhou, Wei PhD; Huo, Donglai PhD; Browne, Lorna P. MD; Zhou, Xin MD, MS; Weinman, Jason MD. Universal 120-kV Dual-Source Ultra-High Pitch Protocol on the Photon-Counting CT System for Pediatric Abdomen of All Sizes: A Phantom Investigation Comparing With Energy-Integrating CT. Investigative Radiology 59(10):p 719-726, October 2024.