



Contribution ID: 29

Type: Oral

Evaluation, comparison, and optimization of the effects of manual versus software-automated protocols on radiation dose and image quality in simulated paediatric chest computed tomography

Friday, 22 November 2019 10:30 (15 minutes)

Background: The aim of this study was to compare the effects of switching from automated to manual acquisition parameters on image quality and radiation dose in several simulated paediatric chest computed tomography (CT) scans. The comparison was made using a CT phantom in order to obtain the lowest possible dose-length product value while maintaining an adequate image quality. The scans were performed by manually reducing the dose below the lowest dose value proposed by automated software prior to the examination.

Methods: An anthropomorphic phantom underwent simulated paediatric chest CT scans using both automated and manual approaches guided by a radiologist for parameter optimization. Different CT acquisition protocols were used, varying kV, mAs, pitch, and adopting iterative reconstruction (IR). The subjective and objective image qualities were assessed by, respectively, radiologists and software. Specific CT dose indices were collected.

Results: CT dose indices were significantly lower adopting a manual approach. Through CT acquisitions, linearity and resolution were quite constant, whereas image noise and uniformity varied between scans, as observed by radiologists using a visual grading analysis. IR was associated with a further dose reduction.

Conclusion: Simulated paediatric chest CT studies performed with manual acquisition settings resulted in important dose reduction when compared to values generated with automated protocols.

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Session Classification: Session V: Radiology - Chair: Dr. Daniel Vetterli