

Purpose: For pediatric CT, optimizing scan technique with reduced dose is critical. A previous phantom study demonstrated that abdominal circumference (AC) can be used effectively in selection of the scan technique. The goal of this study is to clinically verify and fine-tune the technique by using a noise “insertion” software.

Methods: 24 pediatric patients covering wide range of ACs were scanned on a 64-slice CT using the technique chart initially generated from a phantom study. These scans were then reconstructed off-line using a software which “injects” noise into CT projection data to mimic different degree of dose reduction without re-scanning the patient. The accuracy of this software was verified on a water phantom. The original images and those mimicking dose-reduced scans were evaluated by a pediatric radiologist based on the vasculature details in liver, and conspicuity of low contrast lesions. Optimized technique chart for adequate diagnostic image quality and lowest possible dose was generated for the AC from 40cm to 120cm.

Results:The fine-tuned technique chart followed well with the phantom study. For AC from 40 to 50cm, 80kVp with 60 to 100mAs provided adequate diagnostic image quality; for AC from 51 to 70cm, using 100kVp and 40 to 80mAs; for AC from 71 to 100cm, 120kVp with 60 to 110mAs provided balanced dose and image quality; for AC over 100cm, 140kVp may be used, with ≥ 70 mAs. The difference of the CT noise generated by the software vs. from an actual water phantom scan was within $\pm 5\%$.

Conclusions: AC-based pediatric abdominal CT technique chart was verified and fine-tuned on this clinical trial with help of the noise insertion software. Using AC-based chart can avoid ambiguity in selection of optimized scan parameters and it is relatively easy to implement in clinical.