AbstractID: 13269 Title: Automatic Tube Potential Selection for Radiation Dose Reduction in Abdominal CT: Techniques and Experimental Study

Purpose:
The appropriateness of using lower tube potential (kV) is highly dependent on patient size and diagnostic task. We proposed a general strategy that allows automatic adaptation of kV as a function of patient size and diagnostic task. The purpose of this work is to implement this general strategy in adult abdominal CT.

Method and Materials:
The automatic tool was developed based on a novel image quality index, noise constrained iodine contrast to noise ratio. The noise constraint parameter can be adjusted for each exam type. Seven abdominal phantoms were constructed to represent adult abdomens with lateral dimensions of 25, 30, 35, 40, 45, 50, and 55 cm. Three iodine samples were placed in the central region of the phantoms and scanned on a dual-source CT scanner at all available kVs (80, 100, 120, 140). A database including the measured image noise and sample contrast, phantom size, and CTDIvol was created. The relative dose at each kV was calculated as a function of phantom size and a noise constraint parameter that was adjustable for different exam types.

Results:
The proposed strategy provided a quantitative way to select the most dose-efficient kV for different patient sizes and exam types. For angiographic exams, the most dose-efficient kVs were 80, 80, 100, 100, 100, 120, and 140 for phantoms from 25 to 55 cm, respectively. For routine contrast-enhanced abdomen exams, the optimal kVs were 100, 100, 100, 100, 120, 120, and 140. For the 55cm phantom size, 140 kV was always the optimal kV.

Conclusion:
We implemented an automatic kV selection strategy in adult abdominal CT. Dependent on the patient size and exam type, the use of the optimal kV resulted in various dose reduction levels. These results can be directly translated into clinical practice for guiding the kV selection and dose reduction.