Effect of contrast material on image noise and radiation dose in adult chest computed tomography using automatic exposure control: a comparative study between 16-, 64- and 128-slice CT

Jijo Paul, Boris Schell, J Matthias Kerl, Werner Maentele, Thomas J Vogl & Ralf Bauer

PURPOSE
To determine the difference in radiation dose between non-enhanced (NECT) and contrast-enhanced (CECT) chest CT examinations contributed by contrast material with different scanner generations with automatic exposure control (AEC).

METHODS & MATERIALS
Each 42 adult patients received a NECT and CECT of the chest in one session on a 16-, 64- or 128-slice CT scanner with the same scan protocol settings. However, AEC technology (Care Dose 4D, Siemens) underwent upgrades in each of the three scanner generations. DLP, CTDIvol and image noise were compared.

RESULTS
Although absolute differences in image noise were very small and ranged between 10 and 13 HU for NECT and CECT in median, the differences in image noise and dose (DLP: 16-slice: +2.8%; 64-slice: +3.9%; 128-slice: +5.6%) between NECT and CECT were statistically significant in all groups. Image noise and dose parameters were significantly lower in the most recent 128-slice CT generation for both NECT and CECT (DLP: 16-slice: +35.5-39.2%; 64-slice: +6.8-8.5%).

CONCLUSION
The presence of contrast material lead to an increase in dose for chest examinations in three CT generations with AEC. Although image noise values were significantly higher for CECT, the absolute differences were in a range of 3 HU. This can be regarded as negligible, thus indicating that AEC is able to fulfill its purpose of maintaining image quality. However, technological developments lead to a significant reduction of dose and image noise with the latest CT generation.