Purpose:

To investigate the relationship of image noise and organ dose as a function of patient size for abdominal CT exams at 5 different dose levels when tube current modulation is used.

Methods:

This IRB approved study selected 20 patients scanned by a Siemens Sensation64 CT scanner with CareDose4D turned on. Images at lower dose levels (20%, 30%, 50%, and 70%) were simulated for each patient. Noise for each image set was obtained by drawing an ROI in a homogeneous region in the liver. Radiation dose to liver was obtained using a previously validated Monte Carlo simulation package. The perimeter of the patient at the liver level was also obtained.

Results:

Noise and liver dose were plotted as a function of patient size for the 100% dose level image sets. Noise behaves roughly as a linearly function of patient perimeter. This is consistent to the principle of CareDose4D: higher noise is acceptable in larger patients due to the intrinsic better contrast from extra fat tissue. As patient size increase, liver dose also increases in a nearly linear fashion, except for two extra large patients. In addition, noise was plotted as function of liver dose for all the image sets (including all 5 dose levels). For each patient, the noise approximately decreases in an inverse square root relationship as the dose increases, as expected. Larger patients’ images have higher noise at the same liver dose. Therefore higher organ dose is required to achieve a similar noise level.

Conclusions:

This study investigated the relationship between image noise, organ dose and patient size. The results showed that with CareDose4D: (a) both noise and liver dose increases as patient size increases; (b) larger patients require a higher organ dose in order to have a similar noise level as a smaller patient.
Abstract ID: 18436  Title: The Relationship of Image Noise and Organ Dose as a Function of Patient Size for Abdominal CT Exams at 5 Different Dose Levels When Tube Current Modulation Is Used

Funding Support, Disclosures, and Conflict of Interest:

For Michael McNitt-Gray:

Institutional research agreement, Siemens AG

Recipient research support Siemens AG