

Purpose:

To evaluate the performance of a commercial metal artifact reduction algorithm for helical CT scans and to investigate the CT number accuracy improvement on metal-artifact reduced images and its clinical significance.

Methods:

42 helical CT scans of patients with metal implants, 32 cases with small dental or spine filling, 7 with single hip implants, and 3 with bilateral hip prosthesis, were collected and evaluated. The original and corrected images were reviewed side by side from the aspects of overall image quality and visual conspicuity of the prostate (or vagina), bladder, and rectum in consensus for patient cases with hip implants, and visual conspicuity of pharyngeal part of tongue, lymphoma for patient cases with dental filling. The CT number accuracy was evaluated on 10 cases with hip implants by comparing the average CT number and variations within prostate (or vagina) regions on the original and artifact reduced images.

Results:

While residual artifacts are still presented on the corrected images, the metal artifacts were reduced dramatically on all 42 patient cases, especially for the cases with large hip prosthesis. Evaluation also indicates that, as expected, the geometry of anatomic structures was not affected by the algorithm.

Quantitative calibration results using the electron density phantom with tantalum inserts indicates the considerably improvement of electron density distortions. Most importantly, the CT number variations of the prostate/vagina were reduced from 30% to 66.7%. The average CT numbers of those organs were closer to the expected CT number than that on the uncorrected images.

Conclusions:

The evaluations indicate that the commercial algorithm can dramatically reduce metal artifacts. The corrected images have already been used in our clinic to help with tumor/organ delineation and treatment planning. However, further work is needed to evaluate its full impact in treatment planning and dose computation accuracy.