The effect of iterative reconstruction on image quality in evaluating patients with coronary calcifications or stents at coronary computed tomography angiography

Coronary computed tomography angiography (CCTA) is the most common non-invasive diagnostic tool currently used to exclude coronary artery disease. It is the only modality which enables direct visualization of coronary stents and concealed major complications such as stent fracture, in-stent restenosis, or thrombosis. CCTA is complicated in the presence of coronary calcification or stents as it is affected by several factors including artifacts and noise. In day to day practice, both medium and sharp kernels are routinely used in CCTA stent imaging reconstruction. The sharp kernel is used to visualize fine structures as it decreases beam-hardening artifacts and partial volume effects and consequently enhances the spatial resolution as well as stent lumen visualization. Nevertheless, this happens at the expense of image quality and increased image noise. Furthermore, the medium kernel has been advocated in vessel imaging (1-4).

Iterative Reconstruction in Image Space (IRIS) was recently introduced into clinical practice. In comparison to the conventional filtered back projection (FBP), IRIS reduces radiation exposure and enhances image quality with reduction in image noise. In heavy calcification of the coronary arteries, IRIS can reduce image noise and blooming artifacts. This justifies the potential value of IRIS in overcoming current limitations in coronary artery stent visualization together with lowered radiation dose (1-6).

In this context, Güler et al. (7) conducted a prospective analysis of 31 patients with coronary calcific plaques or stents at CCTA to determine the effect of IRIS on image quality by comparing reconstructions of both medium and sharp kernels. Image reconstruction was performed using the conventional FBP and with IRIS algorithm on both medium and sharp kernels. They pointed out that IRIS significantly reduces image noise and improves imaging of coronary calcifications or stents. When combined with a sharp kernel, IRIS can improve image quality by reducing the negative effects of decreased signal resulting from the use of a sharp kernel.

Although the paper focuses on an area of great current interest, it is however limited by the fact that their cohort is small. Notwithstanding, the authors acknowledge in the limitations section that they did not evaluate diagnostic performance using different stent sizes and types. Nor did they dichotomize their cohort according to body mass index. Moreover, use of 0.75-mm slice thickness and 0.4-mm reconstruction increment slice would not give the same precession as 0.6-mm slice thickness and 0.4-mm reconstruction increment. Finally, patient population was heterogeneous, which did not allow a separate analysis for coronary calcification and stents. However, the above limitations do not diminish the impact of the finding that IRIS can significantly reduce image noise and improve the imaging of coronary artery calcifications and stents. This is in concordance with other studies (1-5).

Therefore, the key point is whether routine sharp kernel images constructed with IRIS could modify our daily practice. Existing results are encouraging. Yet further studies are needed to find a role for IRIS in the clinical evaluation of patients with coronary stents or significant coronary calcification.

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