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LETTER TO THE EDITOR

Clinically essential requirement for brain CT with iterative reconstruction

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The Editor

We read with great interest the article titled “Six iterative reconstruction algorithms in brain CT: a phantom study on image quality at different radiation dose levels” by Löve et al.¹ They evaluated six iterative reconstruction (IR) algorithms and concluded that while all improved the image quality of brain CT scans, they exhibited different strengths and weaknesses. The authors also reported that model-based IR algorithms have a potential for a further dose reduction. We would like to comment from a clinical perspective.

While MRI is now the primary imaging modality for most neurological diseases, many patients with ischaemic stroke and intracranial haemorrhage undergo CT because their general status tends to be serious, and the examination time is much shorter with CT than with MRI.

Subtle subarachnoid haemorrhage between cranial bone and the brain surface is occasionally overlooked because of beam-hardening artefacts from the cranial bone. Although Löve et al used Catphan® (The Phantom Laboratory, Greenwich, NY) with an external bone-mimicking ring to simulate beam hardening attributable to the cranial bone, they failed to evaluate the degree of beam-hardening artefacts adjacent to the ring on their scans. For a valid

extrapolation of their phantom results, the effect of each IR algorithm on beam-hardening artefacts must be investigated.

Another important application of brain CT is the diagnosis of ischaemic stroke. Early findings of ischaemia on brain CT scans include “obscuration of the lentiform nucleus”² and the “insular ribbon sign”³, and radiologists must differentiate between the brain grey matter and white matter. However, the difference in the CT number between the grey matter and white matter is as little as 5–10 HU and very small even in normal subjects. To detect such minute CT number differences between the grey matter and white matter, the image noise must be less than at least 5 HU. Based on the information that Löve et al present in Table 3, to obtain an image noise <5 HU, the radiation dose must be 84 mGy or larger for all reconstruction algorithms on all systems. Considering the urgency and life-threatening nature of ischaemic stroke, the focus must be on the acquisition of low-noise CT images rather than on a radiation dose reduction. We think that drastic image noise reduction is difficult at the current technical level of CT. Therefore, we recommend that efforts be directed at improving the image quality of brain CT scans acquired with standard or lower radiation doses by developing new reconstruction algorithms rather than by pursuing the possibility of a radiation dose reduction.

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