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LETTER TO THE EDITOR

Clinically essential requirement for brain CT with iterative reconstruction: author reply

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To the Editor

During the past decade, CT technique has developed rapidly, with the main goal of reducing radiation dose while maintaining image quality. Since large diagnostic accuracy studies are at great risk of being already outdated at the time of publication, simpler clinical feasibility phantom studies¹ and diagnostic acceptability studies have become important tools for evaluation and comparison of the new techniques.

The study by Löve et al.¹ is a phantom study and is therefore limited when it comes to evaluation of specific clinically relevant aspects such as potential influence of beam-hardening artefacts on diagnostic accuracy in sub-arachnoidal haemorrhage, as described by Awai et al.² Such evaluation is clearly outside the scope of the study. In our study, the bone-mimicking ring was instead used to introduce noise in the phantom and thereby more closely resemble the clinical situation with respect to low-contrast resolution, which is clinically very important as Awai et al point out.

In the brain, the difference in CT numbers between grey matter and white matter is normally in the range 5–10 HU. Although visual differentiation of adjacent structures is dependent on standard deviation (SD) of noise in the images, the relationship is far more complex, which is why our study also evaluates noise-power spectra and subjective

evaluation. It is to us unclear on which scientific basis Awai et al argue that “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.” Nevertheless, as seen in Table 3, noise levels (SD) are below or close to 5 HU when applying the advanced IR algorithms at 48 mGy and even in some cases at 12 mGy.

Despite increasing use of clinical guidelines for CT neuro-imaging in clinical situations, such as in trauma, stroke, headache and dementia, utilization of CT is increasing in all age groups—with only a small minority of patients having detectable pathology. Assuming that currently employed clinical CT protocols already are optimized according to the as low as reasonably achievable principle, introduction of a new technique that improves image quality should primarily be used to reduce radiation dose so that image quality remains unchanged. From a clinical and radiation perspective, CT image quality higher than that necessary for the clinical task should not be pursued.

We do not claim that our results can directly be used to change current clinical protocols, but our conclusions can be used as a base for clinical diagnostic acceptability studies aiming at further dose reduction while retaining image quality.

The authors

REFERENCE

1. Löve Å, Olsson ML, Siemund R, Stålhammar F, Björkman-Burtscher IM, Söderberg M. Six iterative reconstruction algorithms in brain CT: a phantom study on image quality at different radiation dose levels. *Br J Radiol* 2013; **86**: 20130388. doi: [10.1259/bjr.20130388](https://doi.org/10.1259/bjr.20130388)
2. Awai K, Higaki T, Tatsugami F. Clinically essential requirement for brain CT with iterative reconstruction. *Br J Radiol* 2014; **87**: 20140474. doi: [10.1259/bjr.20140474](https://doi.org/10.1259/bjr.20140474)