Cervical spine CT scan

van der Kolk et al. investigated whether the image quality of a specific deep learning-based synthetic CT (sCT) of the cervical spine is non-inferior to conventional CT.

Paired MRI and CT data were collected from 25 consecutive participants (≥ 50 years) with cervical radiculopathy. The MRI exam included a T1-weighted multiple gradient echo sequence for sCT reconstruction. For qualitative image assessment, four structures at two vertebral levels were evaluated on sCT and compared with CT by three assessors using a four-point scale (range 1-4). The noninferiority margin was set at 0.5 points on this scale. Additionally, acceptable image quality was defined as a score of 3-4 in ≥ 80% of the scans. The quantitative assessment included geometrical analysis and voxelwise comparisons.

Qualitative image assessment showed that sCT was non-inferior to CT for overall bone image quality, artifacts, imaging of intervertebral joints and neural foramina at levels C3-C4 and C6-C7, and cortical delineation at C6-C7. Noninferiority was weak to absent for cortical delineation at levels C3-C4 and trabecular bone at both levels. Acceptable image quality was achieved for all structures in sCT and CT, except for trabecular bone in sCT and level C6-C7 in CT. Geometrical analysis of the sCT showed good to excellent agreement with CT. Voxelwise comparisons showed a mean absolute error of 80.05 (±6.12) HU, dice similarity coefficient (cortical bone) of 0.84 (±0.04) and structural similarity index of 0.86 (±0.02).

This deep learning-based sCT was noninferior to conventional CT for the general visualization of bony structures of the cervical spine, artifacts, and most detailed structure assessments [1].

[1]

van der Kolk BBYM, Slotman DJJ, Nijholt IM, van Osch JAC, Snoeijink TJ, Podlogar M, van Hasselt BAAM, Boelhouwers HJ, van Stralen M, Seevinck PR, Schep NWL, Maas M, Boomsma MF. Bone visualization of the cervical spine with deep learning-based synthetic CT compared to conventional CT: A single-center noninferiority study on image quality. Eur J Radiol. 2022 Jun 17;154:110414. doi: 10.1016/j.ejrad.2022.110414. Epub ahead of print. PMID: 35780607.

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