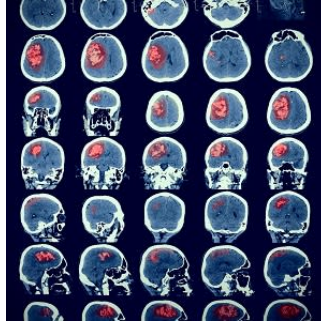## Deep Learning Reduces Need for Gadolinium Contrast

Gadolinium-based contrast agents (GBCAs), used during MRI scans, enhance brain tissue contrast. GBCAs are crucial for brain tumour care because they highlight areas with abnormal blood-brain barrier permeability that tumours cause. This permits monitoring of treatment response and also guide surgical tumour removal. Disadvantages to using GBCAs include gadolinium accumulation, the need for intravenous injections, possible allergic reactions, longer examination times, and the high cost of the contrast agent.

German researchers recently reported in *The Lancet Digital Health* using deep learning algorithms to produce MR images similar to those given when using GBCAs. This is important because it may help radiologists reduce their reliance on GBCAs for demarcating pathological tissue.

Specifically, synthetic 'postcontrast T1-weighted MRI sequences were generated from pre-contrast sequences. These synthetic images were compared to true postcontrast (GBCA-enhanced) T1-weighted MRI sequences in a retrospective study. The team trained and validated their algorithm on over 5,000 MRI scans and independently tested it on another 1,900 exams.

GBCA-free scans showed no differences when used to assess tumour patients' treatment response compared to contrast-enhanced images. The mean time to progression was similar using GBCA-based and synthetic images, although 28% of patients were classified differently. About 15% showed progression using synthetic images and not with GBCA. Since these scans originated from over 200 institutions with different MR scanners, the algorithm may be adaptable to generalize across MRI machines and be clinically useful.

Drs. Alexandros Ferles and Frederik Barkhof of Amsterdam University Medical Center's Department of Radiology and Nuclear Medicine wrote an accompanying editorial. They added: 'Such a performance suggests that synthetic samples could act as a meaningful substitute for GBCA-based images in determining treatment effects (in a trial setting), even if not being perfect copies that are readily recognized by human observers… Whether they perform equally well in a diagnostic setting was not examined.'

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