MRI with GBCAs - Practical help to ensure patient safety

Malayeri et al writes: “At present, there is no evidence suggesting that gadolinium deposition in the brain alters neurologic function”. Where is the evidence for this statement? Free gadolinium is highly toxic. Even though no clinical implications can be drawn from the reported hyperintensities in the dentate nucleus, globus pallidus, pons and thalamus, the findings are worrisome. *Primum nil nocere.* We must ensure that we do not confuse the lack of results with safety. The precautionary principle must be prevalent. High signal intensity in the globus pallidus and dentate nucleus may be present on unenhanced T1-weighted MR images of multiple sclerosis (MS) patients who have undergone a relatively large number of previous gadolinium-based contrast agent (GBCA) administrations. In clinical progression of MS, what is the cause of the most serious problem – is it the result of the deposition of Gadolinium (Gd) or the “natural” course of MS? How should the radiology community react?

Implication for Patient Care: For the MS-patients is it therefore essential to maintain an MRI Log which documents each GBCA administration with a risk-benefit-assessment including clear documentation of date, dose, type of formulation (linear or macrocyclic GBCA), and magnetic field strength (e.g., 3 Tesla (T) or 1.5 T image acquisition). In addition, recommendations for MS patients and physicians for use of GBCA during pregnancy and nursing period should be included in the Log. An MRI CD with cover should be provided to patients to ensure comparability in follow-up examinations. Case report: 39 year old female patient with attack-like course of MS for 12 years underwent 21 MRI with GBCAs performed by five radiologists in university clinics, hospitals, MS centers and practices. No report includes the exact details of the administered GBCAs. The detailed documentation should be obligatory, because neural tissue deposition is detectable with as few as four lifetime doses of GBCAs. In the medical history, patient’s imaging histories in other hospitals may be missed, but the patient’s MRI Log can be reviewed before GBCA administration.

Murata et al collected autopsy tissue samples from 9 patients who had contrast-enhanced MRIs with only a single agent. Exposure included both macrocyclic and linear GBCA (5 gadoteridol, 2 gadobutrol, 1 gadobenate and 1 gadotexate). The result: Gd deposition in normal brain and bone tissue observed with macrocyclic and linear GBCA. Bone levels measured 23 times higher than brain levels; bone deposition was even detected in bone collected 8 years after GBCA exposure. It is possible that bone matrix may rapidly take up small fraction of intravenously administered GBCA and act as a reservoir, slowly releasing Gd with subsequent uptake in other tissues. Gd deposition from the macrocyclic GBCA-gadobutrol may occur within the human brain after multiple gadolinium contrast administrations. Exposure to GBCAs in extremely high cumulative doses can lead to significant Gd deposition in the skin. Rogosnitzky examines in a review the potential biochemical and molecular basis of gadolinium toxicity. Gd deposition is occurring and exact documentation of GBCA usage can improve care for our patients.

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