Single Dose (0.1mmol/kg) Brain Magnetic Resonance Imaging with Gadobutrol at 1.5T and 3.0T: Comparison to 0.15mmol/kg Gadoterate Meglumine

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Purpose: The detection of a possible direct link between the application of Gadolinium based contrast agents (GBCA) highlights the need for dedicated GBCA application protocols [1, 2]. Because of that purpose of the study was to evaluate the efficacy of single dose (0.1mmol/kg bodyweight) gadobutrol compared to a substantially higher dose (0.15mmol/kg bodyweight) gadoterate meglumine in a rat brain tumor model at 1.5T and 3.0T.

Materials and Methods: A cohort of 20 CDF Fisher rats underwent MR exams, either at 1.5T or at 3.0T. All animals were implanted 10µl C6/lac Z Glioma cells using an implanted plastic brain cannula. After 7 days of growth brain MR exams were performed in a randomized order of gadobutrol and gadoterate meglumine with a 24h interval. Both contrast agents are macrocyclic agents but different in concentration. Data acquisition was performed using a T1w TSE technique (TR/TE: 500/16) with a resolution of 0.2x0.2mm² and an acquisition time of 1:52min (figure1). All animals were sacrificed after the second MRI and brains harvested for histopathologic assessment (figure 2). Data were evaluated regarding SNR, CNR and lesion enhancement (LE).

Results: Two animals per group died before completing the imaging protocol, thus leaving data of 16 rats for final evaluation. Both, at 1.5T and at 3.0T, no significant differences between the two contrast agents were found in terms of SNR (62.8 vs 62.8, p=0.9 at 1.5T and 100.7 vs104.3, p=0.4 at 3.0T), CNR (25.1 vs 26.4, p=0.9 at 1.5T and 46.7 vs 49.6, p=0.5 at 3.0T) and LE (31.6 vs 31.6, p=0.98 at 1.5T and 56.2 vs 58.6, p=0.6 at 3.0T) (figure 3).

Conclusion: The amount of gadobutrol needed to reach the same efficacy than gadoterate meglumine is substantially lower. This may be beneficial for patients with impaired renal function. Otherwise, also increasing the dose of gadobutrol to 0.15mmol/kg BW can potentially lead to better lesion delineation.