AbstractID: 10721 Title: Properties Evaluation of a New MRI Contrast Agent Based on Gd –Loaded Nano Particles Coated with Two Different Nano Materials

Objective: The aim of this study was performing the properties evaluation of two novel emulsions composed of a) silicon-based nanocomposite polymer(NCP) and b) Diethylene glycol (DEG) based coating material both loaded with gadolinium(III) oxide(Gd_2O_3) nanoparticles. The contrast enhancement evaluation of Gd loaded nanoparticles in comparison with Magnevist(Gd-DTPA), indicated that gadolinium-nanocomposite polymer emulsions(Gd-NCPE&Gd-DEG) could produce a good MR signal and therefore could be useful potential contrast mediums for cell tracking in magnetic resonance molecular imaging(MRMI).

Materials and Methods: This study was involved with nanoparticles composed gadolinium (III) oxide (Gd2O3), a) emulsified with a silicon-based nanocomposite polymer, POSS-PCU (Polyhedral oligomeric silsesquioxane-poly(carbonate-urea)urethane) and b) capped with Diethylene glycol (DEG) by polyol method starting from of Gd2O3 large particles, leading to Gd2O3 nano size capping with polymers. The size and morphological structure of these nanoparticles determined by particle size analyzer(zeta sizer) and Transmission Electronic Microscope(TEM). Proton relaxation times were measured with a 1.5-T MRI siemense scanner. The measurements were performed in aqueous solution.

Results: The results showed a significantly higher incremental relaxivity for Gd_2O_3 nanoparticles compared to Gd-DTPA in concentrations ≤1.5mM. In such concentrations, the slope of r1 relaxivity(1/T1) vs. concentration curve of Gd-DTPA and Gd_2O_3 were 4.33, 7.98 s^{-1} mM^{-1}. The slope of r2 relaxivity(1/T2) vs. concentration curve of Gd-DTPA and Gd_2O_3 were 5.06, 13.75 s^{-1} mM^{-1}.

Conclusion: The study indicates the possibility of obtaining high relaxivity compared to Gd–DTPA using Gd2O3 as contrast agent.

Keywords :Gd2O3 Nanoparticle, nanocomposite polymer, MRI Contrast Agents, Relaxivity.