

Magnetic Resonance Perfusion Imaging of the Kidney for the Evaluation of Hyperacute Cyclosporine Nephrotoxicity in the Rabbit

Kyung-Sub Shinn, Hyun Kim

Departments of Radiology, College of Medicine, Kangnam St. Mary's Hospital,
The Catholic University of Korea

Purpose: A variety side effects are associated with the use of cyclosporine (Cs), the most relevant of which remains the renal toxicity. This study was designed to evaluate the potential of renal perfusion magnetic resonance (MR) imaging to aid the early diagnosis of hyperacute Cs-induced nephrotoxicity in rabbit.

Materials and Methods: Thirty five New Zealand white rabbits were used for the study and were divided into 2 group: control group (group I, n=5) and Cs-treated group (30 mg/kg, p.o., group II, n=30) . Group II was subdivided into each six subgroup with lapse of time: 2, 4, 8, 12, 24, and 48-hour subgroups. Gd-enhanced dynamic MR imaging of the kidney with T1-weighted TurboFLASH pulse sequence (TR 8.5 msec, TE 4 msec, and FA 10°) was performed in bith group using 1.5T MRI system with a Helmholtz-type receiver coil. Color-coded renal blood volume map of renal perfusion images and MR renograms were obtained by dynamic MR images after a bolus injection of Gd-DTPA and post-processing software for calculation of regional renal blood volume.

Results: Cs level of whole blood was highest in the 2-hour subgroup but GFR was lowest in the 8-hour subgroup of group II. Serum BUN and creatinine levels were within normal range in both group. Histologic findings of the kidneys showed no definite structural abnormality in both groups. Color-coded renal blood volume map of renal perfusion images in group I showed distinct corticomedullary differentiation with high perfusion in the renal cortex and relatively low perfusion in the renal medulla. In group II, the renal cortical perfusion was reduced in 2, 4, and 8-hour subgroups.

Conclusion: Therefore, early reduction of renal cortical perfusion in relation with Cs level of blood was well demonstrated on both MR perfusion images and MR renograms obtained from dynamic MR imaging. In conclusion, it is considered that color-coded renal blood volume map of MR perfusion imaging is

a valuable method in early detection for functional abnormality of hyperacute Cs-induced nephrotoxicity prior to the manifestation of serologic and microscopic structural abnormalities.