The Role of MR VCUG in The Diagnosis of Vesicoureteral Reflux: Comparative Study with Fluoroscopic VCUG

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Purpose: To evaluate the role of magnetic resonance voiding cystourethrography (MR VCUG) in the diagnosis of vesicoureteral reflux (VUR) and to compare the accuracy of MR VCUG with that of fluoroscopic VCUG in the detection of VUR.

Materials and Method: A phantom study was performed to determine the optimum concentration of gadolinium dimeglumine in achieving the maximum signal intensity of the urine. MR VCUG was performed upon 20 pediatric patients with or without urinary tract infection. Pulse sequences included coronal T1-weighted spin-echo (SE), and T2-weighted fast spin-echo (FSE) or HASTE images before filling of the baldder with a mixture of normal saline (NS) and 0.5 mmol/ml of gadopentetate dimeglumine (Gd-DTPA), coronal T1-weighted SE images after bladder filling, and immediate post-voiding coronal T1-weighted SE or fast multiplanar spoiled gradient-echo (FMPSPGR) or turbo FLASH images. The findings of MR VCUG were compared with those of fluoroscopic VCUG performed within 6 months of MR VCUG.

Results: The optimum ratio of the mixture of NS to Gd-DTPA in achieving the maximum signal intensity of the urine was 200:1 for T1-weighted SE and 800:1 for FMPSPGR sequence, respectively. VUR was detected in 23 urinary tracts (16 VUR's by both MR VCUG and fluoroscopic VCUG, five VUR's by fluoroscopic VCUG only, and two VUR's by MR VCUG only). The sensitivity of fluoroscopic VCUG and MR VCUG in detecting VUR was 91.3% (21/23) and 78.3% (18/23), respectively. The grades of VUR on MR VCUG were concordant with those on fluoroscopic VCUG in 16 urinary tracts with VUR. The morphologic abnormalities of the kidneys including renal scarring were better evaluated with MR VCUG than fluoroscopic VCUG.

Conclusion: To avoid radiation hazard, MR VCUG can be used in the detection of VUR in selective pediatric patients who are candidates for repeated fluoroscopic VCUG and/or renal cortical scintigraphy, although further technical development is necessary. In addition, morphologic abnormalities of the kidneys including renal scarring can be better evaluated with MR VCUG than with fluoroscopic VCUG.