Technetium-99m-dimercaptosuccinic acid renal scintigraphy in antenatal hydronephrosis

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Aim: The purpose of this study was to evaluate damage of the kidney with technetium-99m- dimercaptosuccinic acid (99mTc-DMSA) scintigraphy in children with antenatal hydronephrosis (ANH) and the influence of other postnatal associated diagnoses on abnormal 99mTc-DMSA findings.

Subjects and Methods: 99mTc-DMSA scintigraphy in 54 children (17 girls and 37 boys), aged from 2 months to 5 years (median 11 months) with 66 antenatal hydronephrotic renal units (RU) (42 unilateral hydronephrosis-29 boys and 13 girls; 12 bilateral hydronephrosis-8 boys and 4 girls) was performed. Male/female ratio was 2,2: 1, unilateral/bilateral hydronephrosis ratio was 4:1. Hydronephrosis classified into three groups according to ultrasound measurement of the antero-posterior pelvic diameter APD): mild (APD 5-9.9mm) was present in 13/66RU, moderate (APD 10-14.9mm) in 25/66RU, and severe (APD ≥15mm) in 28/66RU. Simple hydronephrosis was present in 15RU, and the postnatal associated clinical diagnosis were vesicoureteric reflux (VUR) in 21, pelviureteric junction (PUJ) obstruction in 7, pyelon et ureter duplex in 11, megaureter in 11 and posterior urethra valves in 1RU, respectively. Static renal scintigraphy was performed 2 to 3 hours after intravenous (iv) injection of 99mTc-DMSA using a dose of 50μCi/kg (1.85MBq/kg; minimal dose: 300μCi). Four views (posterior, left and right posterior oblique and anterior) were obtained with a head gamma camera "Orbiter" filtered with high resolution parallel whole collimator. All images were stored in an Pegasys computer with a matrix size of 256×256. The relative kidney uptake (RKU) between the left and right kidney was calculated as an average number counts from anterior and posterior view. Renal pathology was defined as inhomogenous or focal/ multifocal uptake defects of radiopharmaceutical in hydronephrotic kidney or as split renal uptake of <40%, and poor kidney function was defined as split renal uptake <10%. Descriptive and analytical statistics (SPSS version 20.0) was performed. Analytical statistics implied the non-parametric Mann-Whitney test for determination of statistically significant difference between the normal and pathological findings on 99mTc-DMS scan. The default level of significance was $P<0.05$.

Results: Our 99mTc-DMSA scintigraphy findings in children with ANH were: decreased or enlarged kidney with inhomogeneous kidney uptake radiopharmaceutical in 22, irregular shape kidney with inhomogeneous accumulation of radiopharmaceutical in 3, connected (fused) kidney in 1 patient, and poorly or nonvisual kidney in 14RU respectively (total 40/66RU with pathological 99mTc-DMSA finding, 60,6%). Relative accumulation in hydronephrotic kidney was less or equal to 40% in 17RU, less than 10% in 14RU and inhomogeneous radiopharmaceutical uptake with relative accumulation over 40% was detected in 9RU. Regular kidney morphology with homogeneous accumulation of radiopharmaceutical (normal DMSA scintigraphy finding) were found in 26/66RU (39,4%). Statistically significant correlation between the degree of the hydronephrosis (APD) and 99mTc-DMSA scan findings ($P<0.001$) and between the degree of the VUR and DMSA scan finding ($P=0.002$) was established. In our study, other associated diagnosis were not statistically correlated with pathological findings on 99mTc-DMSA scan due to low number of patients.

Conclusion: On the basis of these results (60% pathological findings) we recommend 99mTc-DMSA scintigraphy in the evaluation renal pathology in children with antenatal hydronephrosis. Greater number of patients is needed for the estimation of the associated diagnosis (other than VUR) influence on the renal parenchymal damage in children with ANH.

Biography

Boris Ajdinovic is the Head of Institute for the Nuclear Medicine, Military Medical Academy, Belgrade. He is a Professor and has obtained Doctor of Science degree in Nuclear Medicine. He has graduated from University of Belgrade in 1978 and has obtained Nuclear Medicine specialization. He is an Instructor of Nuclear Medicine for students specializing in internal medicine and surgery from 1985. He has over 250 specialized and scientific published articles and is the recipient of many awards and honors.

Received: April 29, 2022; **Accepted**: May 02, 2022; **Published**: May 25, 2022