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Impact of the background Region of Interest in the relative renal function

E. Sousa, M. J. Carapinha, T. Vaz, F. Lucena, L. Vieira;
ESTeSL, Lisbon, PORTUGAL.

Introduction: Renal scintigraphy with ^{99m}Tc -dimercaptosuccinic acid (^{99m}Tc -DMSA) is performed with the aim of detect cortical abnormalities related to urinary tract infection and accurately quantify relative renal function (RRF). For this quantitative assessment Nuclear Medicine Technologist should draw regions of interest (ROI) around each kidney (KROI) and peri-renal background (BKG) ROI although controversy still exists about BKG-ROI. The aim of this work was to evaluate the effect of the normalization procedure, number and location of BKG-ROI on the RRF in ^{99m}Tc -DMSA scintigraphy. **Methods:** Forty seven children (15 ± 11 months; 22 male) referred for ^{99m}Tc -DMSA scintigraphy underwent the following protocol: posterior and posterior oblique static images, acquired approximately 150minutes after the administration of $36.5\pm 11\text{MBq}$ of ^{99m}Tc -DMSA, with a Low Energy High Resolution Collimator, 140keV, 20% window, 256×256 image matrix and zoom=1.66. All studies were conducted using a double-detector gamma-camera during 10 minutes or 300kcounts. Data were processed on Xeleris GETM workstation by one operator, using Renal DMSA Uptake Analysis application. KROI were draw manually around each kidney and peri-renal BKG-ROI were automatically generated through three different methods: circumferential ROI around the totality of each kidney (2R); crescent semiROI externally to each kidney (2sR); one rectangular central inferior ROI (1R). Right and left kidney differential function (RKF; LKF) was assessed for each method. Sample studied included RKF and LKF between 45-55% in all methods and no evidence of renal scar. To evaluate the significance and association between the variables, the Levene's, ANOVAII and Pearson correlation tests were used. **Results:** Paired samples correlations for all non-normalized

and normalized data found significant differences in 2sR and 1R ($p < 0.001$). Levene's Test and ANOVA in normalized data indicated that there were not significant differences for gender ($p > 0.05$) though higher significance values were found in 2R method. Although the Pearson r showed positive correlation between the three methods for both kidneys and excellent correlation for all methods applied to the right kidney ($r \geq 0.94$, $p > 0.01$), it was achieved a low correlation for the left kidney with 2R when compared with the other methods ($r > 0.31$, $p > 0.05$). Conclusion: Results suggest that normalization should be performed when using 2sR and 1R methods. All three methods originate similar RRF values for normalized data, although the 2R method appears to be more precise. The effect of the location of the BKG-ROI had more impact in the value of the LKF.