Preliminary diagnostic performance of RENEX, an expert system to detect renal obstruction using Tc-99m MAG3
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Objectives: Interpretation of diuresis renography studies requires experience and expertise and could be facilitated by a decision support system. This prospective study was conducted to evaluate the diagnostic performance of an expert system, RENEX, in patients with suspected obstruction referred for Tc-99m MAG3 diuresis renography.

Methods: The RENEX methodology and initial testing have been previously described (Garcia et al. J Nucl Med 2005: 46:205-206P). RENEX was prospectively evaluated in 60 randomly selected patient studies (117 kidneys) obtained because of suspected obstruction; there were 28 males, 32 females and the mean age was 54 years. Each subject had a baseline MAG3 scan. Obstruction was excluded by the baseline scan in 17 subjects; 43 subjects received furosemide followed by a second 20 min acquisition. Technologists approved or modified automatically assigned kidney, cortical, and background ROIs and assigned pelvic ROIs and the time interval for the calculation of the T1/2. Quantitative parameters were automatically extracted from the two acquisitions, placed in an XML file and forwarded to RENEX. An expert and RENEX graded each kidney as obstructed, equivocal or not obstructed; both the experts and RENEX were blinded to the clinical history.

Results: RENEX requested furosemide in 3/16 subjects who did not receive furosemide and in whom the expert interpretation was no obstruction; for purposes of data analysis, these studies were considered to represent obstruction by RENEX. RENEX agreed with the expert reading in 86% (73/85) of non-obstructed kidneys, in 82% (14/17) of obstructed kidneys and 53% (8/15) of equivocal kidneys. Ninety-seven percent (73/75) studies interpreted as not obstructed by RENEX were interpreted as not obstructed by the expert reader; the remaining 2 were indeterminate. On the 17 kidneys interpreted to be obstructed by the expert reader, RENEX considered 14 to be obstructed and 3 equivocal. Many of the equivocal kidneys and kidneys in which the expert and RENEX disagreed were kidneys with markedly reduced renal function.

Conclusions: RENEX showed good agreement with the expert interpretation and should be a useful tool to assist in the diagnosis of renal obstruction. Results can be improved by the addition of software to distinguish between diffuse parenchymal and focal collecting system retention and modifying the weight given to specific interpretative rules.

Research Support: National Library of Medicine, RO1-LM007595