

dren can also discriminate between grade I-II and IV-V of VUR and that in children with UTI and VUR abnormal findings in the scintigraphy were more higher than in children with UTI alone.

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Scintigraphic Evaluation of Perconditioning Protection on Renal Ischemia/ Reperfusion Injury in Rats

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Purpose: We determined the role of remote per-conditioning (RPeC) on renal function and histology in an animal model of unilateral renal ischemia and reperfusion (IR) injury. **Methods:** Sprague-Dawley rats were subjected to 60min of unilateral renal ischemia without right nephrectomy. RPeC protocol was the application of four cycles of 5min ischemia and reperfusion of left femoral artery during renal ischemia. Assessments of histological changes and renal function were made 24h, 1wk, or 3wk later. In each time point of reperfusion, 99mTc-DMSA scan was performed using a small-animals SPECT system. **Results:** Unilateral renal ischemia and 24h reperfusion decreased the 99mTc-DMSA uptake in the left kidney compared to the intact kidney of control animals. Rats receiving RPeC have higher uptake compared to the IR group in 24h. After 1wk and 3wk, uptakes were gradually increased in both groups. Histological studies showed severe morphological changes in the ischemic kidneys which attenuated after 1wk and 3wk. No significant morphological difference was observed in the RPeC compared with the IR group in these time points. Moreover, no differences in creatinine and blood urea nitrogen levels between IR-treated and intact animals were observed. **Conclusion:** The results of the present study suggested that remote per-conditioning improves the ability of rat kidney to tolerate subsequent ischemic injury in the first day after reperfusion. Moreover, non-invasive 99mTc-DMSA scan revealed a suitable tool in the follow-up evaluation of recovery process in the unilateral renal IR injury models of rodents. **Keywords:** Ischemia/reperfusion injury, acute kidney injury, recovery, animal SPECT, scintigraphy, remote ischemic per-conditioning, follow-up study

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Standardisation of F-15 renography with renal output efficiency

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Purpose/Introduction: Diuresis renography is a cardinal test for assessing renal drainage in patients with suspected obstruction (clinical symptoms and/or dilatation of collecting system on other imaging). There are three techniques based on timing of Furosemide; F+20, F-15 and F+0. Assessment of drainage is

achieved by reviewing sequential images, renograms and quantification data including renal output efficiency (OE); a quantitative measure of drainage independent of function. Guidelines have supported administration F-15 for suspected obstruction, because of its maximum diuretic potential, as well as OE quantification. As a tertiary urology centre, this is a common problem and since 2002 we have performed only F-15 and calculated OE accordingly. Due to paucity of literature with regards to standardised curves for F-15 and OE ranges, the aim of this project is to provide standardised curves for F-15 and to define OE ranges which relate to normal, equivocal and obstructed curves. **Subjects and Methods:** Retrospective analysis of F-15 MAG3 renography examinations of 207 patients with suspected pelviureteric junction obstruction (PUJO). Our patients were 54% female and 46% male. The average age was 49.6 (range 23-96). Demographic data, curve shape and OEs taken between 27 to 33 minutes were collected and correlated. The F-15 curves were visually divided into normal, equivocal, obstructed and flat curves and OE ranges were then derived in relation to them. The number of interrupted studies was also noted. **Results:** Curves were found to fall into four main categories -Normal curves: drainage to baseline, in 61.5%, -Equivocal curves: drainage between that of normal and obstructed, in 28.8% -Obstructed curves: plateau or rising, in 9.7%. -Flat curves: low flat, not encountered but fourth possible shape. OE correlation with curves: -Normal curves: mean OE= 94 +/- 2.6 (84.1- 98.2%) -Obstructive curves: mean OE= 51.3 +/- 16.2 (20.8- 76.6%) -Equivocal curves: mean OE= 76.1 +/- 8% (56.1- 90.5%) 8.9% of the studies interrupted for micturition with conjoined renograms. **Discussion/Conclusion:** F-15 optimises diuretic effect at time of isotope injection. Some consider it unfavourable if urgency leads to contamination and interruption of study. This was not a problem and there were no patient recalls. Using these standardised curves with OE helps objective analysis, assisting the multi-factorial process of management of PUJO. We demonstrated OE values < 55%, 75-80% and >90% suggest clear obstruction, equivocal and normal drainage respectively. If within 55-75% and 80-90% ranges, further correlation with other parameters, imaging and clinical features will be required.

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Activity quantification (E%) in late postmobilization images with mean parenchymal transit time MPTT in dilated and obstructed pelvis when diuretic test is contraindicated

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Aim: to assess the usefulness of mean parenchymal transit time (MPTT) and E% (variation of activity 60-90 min post-mobilization images respect the activity at the end of reno-scintigraphy with

^{123}I -Hippuran (^{123}I -OIH) or $^{99\text{m}}\text{Tc}$ -MAG3), to differentiate between obstruction and dilatation in a non-obstructed system in neonates (< 4 months) or children with abdominal pain and hydronephrosis with contraindications to perform furosemide-test. **Materials and Methods:** Twenty children (mean-age 30+/-43 months, 17 males) with sonographic diagnosis of hydronephrosis 3° or 4° stage, without VUR, and antero-posterior diameter (APD) suspected for UPJ stenosis (*Clin J Am Soc Nephrol* 10:20015) (postnatal confirmed) were included in this study. The analysis comprises 40 renal units: 21 with hydronephrosis, 19 contralateral kidneys for control. Of them 10 renal units were operated (Dilated Obstructed DO), on the basis of significant progression of hydronephrosis (mean+/-SD APD 20.3+/- 6.4 vs. 26 +/- 5.5; $p < 0.02$), and 11 out of 21 Dilated-Non-Obstructed (DNO) renal units were followed conservatively for 6-18 months through repeated sonography demonstrating reduction of DAP (mean+/-SD APD 17.1+/- 5.1 vs. 11.9 +/- 5 ; $p < 0.005$) and urologic evaluation. The remaining 21 contralateral Normal kidneys (NK) were used as control group. The relative (RF%) and absolute (CI) renal function, MPTT, E% and variation Δ APD were measured. **Results:** No significant difference was found between DO and DNO groups for CI and RF% , APD and mean age at diagnosis; significant difference was found for MPTT (mean+/-SD DNO 226.1+/- 56.1 vs. DO 388.8 +/- 133.8; $p < 0.02$. DO 388.8 +/- 133.8 vs NK 135.1+/- 24.2), Δ APD (mean+/-SD -5.2+/- 4.7 vs. 4.4 +/- 4.3 ; $p < 0.001$) and E% (mean+/-SD 80 +/- 17 vs. 40 +/- 20 ; $p < 0.001$). No difference was found between NK and DNO CI, while was found for NK and DO CI (mean+/-SD 306+/- 38 vs. 251 +/- 64 ; $p < 0.05$). Stepwise discriminant analysis applied to 21 hydronephrotic renal units found that E% correctly identified 10/11 DNO and 9/10 DO with a diagnostic accuracy of 91% ($p < 0.001$) and MPTT correctly identified 10/11 DNO and 8/10 DO with a diagnostic accuracy of 86% ($p < 0.001$), E%+MPTT correctly identify 10/11 DNO and 10/10 DO with a diagnostic accuracy of 95% ($p < 0.0001$). **Conclusion:** MPTT+E% quantification, if confirmed on a larger cohort, seems a valid tool for UPJ obstruction even in the cases where diuretic test is contraindicated.

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Tc99m DTPA renography owes a characteristic pattern in patients with chronic parenchymal renal disease associated with significant renal function impairment

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Purpose: To verify possible presence of a characteristic renogram pattern for patients with chronic parenchymal renal disease (CPRD) associated with significantly impaired renal function. **Subjects and Methods:** Patients presenting for Tc99m DTPA dynamic renal scan with diagnosis of non obstructive nephropathy together with significant renal functional impairment confirmed by laboratory data , attributed to radiologically diagnosed CPRD. The renogram pattern of these kidneys is compared to the normal renogram pattern. **Results:** 49 patients (24 females and 25 male) with age range from 19 to 91 years

with CPRD and significantly impaired renal function are included, with 95 functioning kidneys (2 patients with nephrectomy and one with non functioning kidney). Tc99m DTPA dynamic renal scan was performed with creation of renography for each kidney. The global GFR ranges from 13.6 to 31.4 ml/min with individual GFR ranging from 5.5 ml/min up to 26.3ml/min. with a median value of 20.4 ml/min and 14.9 ml/min respectively. All renograms have low amplitude , less than 50% of normal amplitude, lacking the normal pattern and time sequences. In 89 kidneys (93.7%) the pattern is in the form of short ascent of first vascular phase followed by slowly descending curve that has a shallow slope compared to normally expected slope of third washout phase, with neither secretory phase nor normal peaking. Out of the remaining six kidneys, four (4.2%) have similar low amplitude and short ascent of the curve followed by abrupt minimal drop then the curve exhibits slow shallow slope descent. The other two kidneys (2.1%) exhibit in addition to the low amplitude, shallow slope ascending second phase with slightly delayed peak followed by shallow slope curve descent. The former curve pattern, seen in 93.7% of kidneys, is considered characteristic for patients with CPRD and significant renal functional impairment. This figure increases to 97.9% on addition of few kidneys that exhibit same curve pattern with minimal abrupt drop prior to the slow curve descent. **Conclusion:** Patients with significantly impaired renal function due to CPRD have a characteristic renogram pattern, that has an evidently low amplitude ,short ascent of the curve followed by slow curve descent that has a shallow slope, seen in 93.7% of studied kidneys, this figure increases to 97.9% by adding renograms of few kidneys in which the slow curve descent is preceded by abrupt minimal drop of the curve, further study on a larger number of patients is advisable to confirm our data.

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Is normalized residual activity a good marker of renal output efficiency in hydronephrosis?

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Introduction: Hydronephrosis is a condition where urine overfills, or backs up, into the kidney, which causes the kidney to swell. Infants with hydronephrosis may be diagnosed before (prenatal) or after (postnatal) birth. The $^{99\text{m}}\text{mag3}$ renal scintigraphy is the method of choice in the study of the functionality of obstruction in hydronephrosis. The objective of this study is to investigate the robustness of the normalized residual activity (NORA) for the estimation of renal emptying during renography. **Methods:** Thirty-one patients (19 boys and 12 girls) with 51 dilated pelvicaliceal units had undergone a $^{99\text{m}}\text{mag3}$ diuretic renal scintigraphy. The mean age was about 5.28 years, ranges from 3 months to 17 years old. Hydronephrosis was bilateral in 12 cases. The main causes of the Conditions of hydronephrosis were ureteropelvic junction (UPJ) obstruction in 10 cases, megaureter in 5 cases, Neurogenic bladder and uropathy malformation in 2 cases, and posterior urethral valve in one case. The normalized residual activity (NORA) was defined as the renal