Original Article

Improvement of renal function after relief of chronic partial upper urinary tract obstruction

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ABSTRACT

Background: Kidney's functional and anatomical changes reversibility of after treatment of partial ureteropelvic junction obstruction (UPJO) is not defined well. Therefore, in this clinical trial study, we've evaluated these changes.

Methods: In a clinical trial study with non randomized-simple sampling, 32 patients with chronic partial obstruction of urinary tract due to unilateral UPJO were studied. In each patient, IVU, DMSA, DTPA, and bilateral kidney sonography were down pre and post operatively. Paired t-test, Wilcoxon, and McNemar tests analyzed data. P-value less than 0.05 was considered significant.

Results: Mean age of the patients was 5.44 ± 0.47 years old and 40.6 % of the patients were male. Split function mean in DMSA had significant difference, comparing pre and post operatively ($P<0.05$). There also was a significant difference in mean of retention time and T1/2 of DTPA ($P<0.05$), comparing pre and post operatively ($P<0.05$). Mean of kidney pelvis diameter had significant difference, comparing pre and post operatively ($P<0.05$).

Conclusion: Our study showed that operation of chronic partial obstruction of kidney, could improve kidney function. We also showed that sonographic evaluation of kidneys could help to evaluate kidney function in these patients.

Keywords: obstructive uropathy, kidney reversibility, ureter obstruction

Obstructive uropathy with resultant hydronephrosis is the eventual outcome of many urological disorders [1]. Urinary tract obstruction (except for accidental ureteral ligation and calculus) in human is nearly always chronic and partial [1]. The accurate prediction of the renal function recoverability after the relief of chronic partial obstruction is of great clinical value to the urologist and nephrologist [1]. Some studies have been done for predicting the probability of renal function recovery, but up to now there is no documented data about it. If restoration or improvement of renal function appears probable, surgical relief of obstruction may be indicated [1,2]. Even though there has been a considerable initial loss of function and irreversible atrophy due to hydronephrosis in partial ureteral obstruction, occurs usually in early weeks after the obstruction [3] and some recoverability has been seen post operatively in some prolonged obstructions (until 150 day) after operation [4].

The aim of this study was to determine renal function improvement after relieving partial obstruction.

Subjects and Methods

In a prospective clinical trial (before-after) study with non randomized simple sampling, 32 cases of chronic and partial urinary tract obstruction with established diagnosis of uretropelvic junction obstruction (UPJO) were selected between years 2000 and 2003. We selected only cases with normal urea (BUN) and creatin (Cr) blood levels that didn't have single kidney or bilateral obstruction. In initial assessment, all the patients were evaluated with intravenous urography (IVU), ultrasonography (for dimensions of kidney and renal pelvis), DMSA scan, and DTPA scan. In suspected cases with ureteral dilatation in IVU or ultrasonography, voiding cystourethrography (VCUG) was done for ruling the vesicoureteral reflux (VUR) out.

Split function in DMSA, $T_{1/2}$, retention time in DTPA scan and visualization of kidney after 5 minutes in IVU were our indexes in these tests. After initial evaluation, each patient underwent surgical procedure for relief of obstruction by

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Table 1. Means of some assessed indices before and after surgery.

Assessed Index	Mean before surgery (mm)	Mean after surgery (mm)	P-value
Kidney length of affected kidney	4.21 ± 89.24	3.94 ± 82.14	0.004
Kidney length of normal kidney	65.96	81.63	0.001
Antero-posterior diameter of renal pelvis in affected kidney	2.93 ± 27.429	1.51 ± 19.02	0.007

"Dismembered pyeloplasty" method. Six months after surgery, each of initial assessments were repeated and compared with each other. Statistical tests were paired t-test, Wilcoxon, and McNemar tests. P-value less than 0.05 was considered significant.

Results

Mean (± SE) age of patients was 5.44 ± 0.47 years old and 19(40.6 %) of patients were male and 12(30.6%) were female. All patients had normal BUN and Cr and none of them had VUR. All data for each variable in our study, except for IVU, had normal distribution. Mean of split function in DMSA in affected kidney were 42.53 ± 3.23 and 46.73 ± 2.80, before and after surgical procedure, respectively. There was a significant difference between these means (P = 0.018).

Also we showed that there is a significant difference between means of split function in DMSA in normal kidneys before and after surgery. (59.86 ± 2.84 vs. 55.48 ± 2.22, P < 0.021).

Our study also showed that there is a statistical significant difference between means of DTPA retention time, before and after intervention in affected kidney (19.68 ^{min} ± 2.25 vs. 9.86 ^{min} ± 1.48, P= 0.001). Also we found a significant difference between mean of $T_{1/2}$ in DTPA before and after surgery in affected kidney (57.51 $^{min.}$ ± 9.73 vs. 18.34 $^{min.}$ ± 3.06, P= 0.000).

From 32 patients in our study, 19 patients have non-visualized kidney in preoperative IVU but their IVU was visualized after 5 min, post operatively. Four patients have non-visualized IVU before and also after surgery, and 9 cases have visualized kidney in IVU before and after surgery. So, results of our study showed that surgery has significant effect in visualization of kidney in post operative IVU (P= 0.000). Other assessments (before and after surgery) have been collected and showed in Table 1.

Discussion

Obstructive uropathy is prevalent in childhood, especially at first Six years of life [5]. Mean age of our cases is 5.4 years old, which is in the limits of other studies [6].

Like some other studies [7] and against others [8], our study revealed that relief of chronic obstruction in its prevalent from, uretero pelvic junction obstruction (UPJO), leads to significant improvement in renal function.

We found that in 65.4% of cases split function in DMSA scan of affected kidney significantly improved with surgery. In addition to split function other indices of renal function in DTPA scan improved significantly.

Like some other studies [9] and against others [10] increased length of affected kidney and antero-posterior diameter of renal pelvis decreased significantly after surgery. Intravenous urography, although remains a qualitative primary diagnostic methods, but it was unsuitable for predicting renal function recovery in UPJ stenosis, as many cases with nonvisualized kidneys on IVU, regained reasonable function after the relief of obstruction .So it mainly was helpful for ruling the associated anomalies out like uretero-vesical junction stenosis, or double collecting system. Ultrasonography is a great help in evaluating the degree of obstructive renal damage, through assessment of the thickness of the renal parenchyma (measuring length and width of kidney and dimensions of renal pelvis) [1]. In this study we showed a correlation between values of ultrasono-

graphic indices and other expensive evaluations like DMSA, DTPA, and IVU, so we can use standard ultrasonographic values, with great reliability, for follow up. Radioisotope renal scintigraphy has been suggested as a method to assess the potential reversibility of functional impairment of renal tissue damaged by obstructive disease and most investigators agree that in the adult population a kidney with a 99mTc-DTPA GFR of<10% of the total normal GFR (10mL/min) is considered unsalvageable, but renogram may be misleading in neonates and young children. Therefore, they should be used only to support the decision for surgical correction. The decision for nephrectomy should not be based solely on renograms, but other factors should also be considered [1].It is difficult to differentiate unsalvageable kidneys from potentially salvageable ones, when using a single test only. For these reasons we used combining different testes.

Our results revealed curative and cost-beneficial effect of surgery, so we suggest operation in all patients who suffer from chronic partial obstruction and have hopeful signs for renal function recovery.

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