Original Article

Role of ureteric stents in relieving obstruction in patients with obstructive uropathy

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Abstract

Purpose: The aim of this study is to evaluate the role of ureteric stents in relieving obstruction and improvement of kidney function in patients with obstructive uropathy.

Materials and Methods: This study involved 138 patients with obstructive uropathy with age ranged from 2 months to 73 years. Patients classified into two groups: Group (I): Includes 57 patients (41.3%), ureteric stents fixed to them; and Group (II): Includes 81 patients (58.6%) managed by other treatment modalities. All patients underwent clinical assessment, Laboratory and radiologic investigations: At presentation and postoperative. These included: Complete urine analysis, urine culture and sensitivity, serum creatinine, serum urea nitrogen, serum uric acid, serum sodium (Na), serum potassium (K), Fasting blood glucose level and blood picture and plain X-ray (KUB), abdominal ultrasonography (US), diuretic renography and retrograde pyelography.

Results: Renal glomerular filtration rate (GFR) was used as an indicator for improvement of renal function after fixation of ureteric stent. In group I: 56 (71.8%) kidneys showed significant recovery compared to 61 kidneys (66.3%). In group II, there is statistically significant relation between renal perfusion and renal recovery ($P < 0.004$), statistically significant relation between parenchymal thickness and recovery in both groups ($P < 0.0002$), statistically significant relation between degree of corticomedullary differentiation and recovery ($P < 0.0003$) and statistically significant relationship between hemoglobin levels at presentation and the recoverability ($P < 0.002$).

Conclusion: The predictors of renal recoverability revealed that ureteral stents alone can help in regaining renal function and significant improvement of clinical condition in patients with obstructive uropathy.

Key Words: Diuretic renography, obstructive uropathy, ureteric stents

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Received: 17.01.2012, **Accepted:** 30.01.2012

INTRODUCTION

The term of obstructive uropathy describes the structural impedance to the flow of urine anywhere along the urinary tract. Obstructive uropathy with resultant hydronephrosis is the eventual outcome of most urologic diseases.[1] Obstructive uropathy is more common among Egyptian patients where bilhariziasis and its complications as well as urinary calculi are common.[2] Early relief of obstruction may cure acute renal failure due to post renal etiology or convert the situation of chronic renal failure from advancing progressive disease to stable renal insufficiency compatible with comfortable life.[3] If restoration or improvement of renal function appears probable; relief of obstruction may be indicated. Even though there has been considerable initial loss of function in patients whose kidney function is irreversibly damaged by the underlying obstructive process. It may be preferable to apply nonsurgical management.[4] Ureteral stenting is an important procedure for

Access this article online	
Quick Response Code:	Website: www.urologyannals.com
	DOI: 10.4103/0974-7796.115731

the release of obstruction. Close follow-up of stented patients is valuable in early detection of morbidity or complications.[5] The accurate prediction of recoverability of kidney function after relief of obstructive uropathy is of great potential clinical value to the urologist and nephrologists.[6] The aim of this study is to evaluate the effect of ureteric stents in relieving obstruction in patients with obstructive uropathy.

MATERIALS AND METHODS

This study conducted at Urology Department, Al-Hussein University Hospital for 138 patients with obstructive uropathy. Of 138 patients 95 (68.8%) were males and 43 (31.1%) were females. The age of the patients ranged from 2 months to 73 years with mean age (42.38 years). From 138 patients 87 (63.1%) patients had unilateral obstruction. Fifty one (36.9%) patients had bilateral obstruction or obstruction in single kidney.

All patients underwent clinical assessment, laboratory and radiological investigations: At presentation and postoperative. These included: Complete urine analysis, urine culture and sensitivity, serum creatinine, blood urea nitrogen, serum uric acid, serum sodium (Na), serum potassium (K), fasting blood glucose level and complete blood picture (CBC) and plain X-ray (KUB). Abdominal ultrasonography (US) was carried out in all patients with measuring renal size, parenchymal thickness, grade of echogenicity and degree of hydronephrosis. Retrograde pyelography was done preoperatively to the non-visualized reno-ureteral units in the IVU. Technetium-99 m diethylenetriamine pentaacetic acid (99 m Tc DTPA) was used for diuretic renography according to the standard protocol and 40 mg furosemide was injected 20 minutes after injection of (99 m Tc DTPA).

Patients classified into two groups: Group (I): Includes 57 patients (41.3%), ureteric stents fixed to them; and Group (II): Includes 81 patients (58.6%) managed by other treatment modalities. Follow up of the patients done by: Repeating the previously mentioned laboratory investigations, abdominal ultrasonography and diuretic renography. Many types of ureteric stents were used as silicone double pigtail stents and Memokath ureteric stent, also named Memokath 051, which used for long-term treatment of patients with ureteric strictures. The Memokath stent is a coil of a nickel-titanium alloy which has "shape memory" end expanding when heated to 55°C. It had been used in 3 patients (2 patients with cancer bladder and 1 patient with post radiotherapy in cancer ovary).

RESULTS

One-hundred and thirty-eight patients with obstructive uropathy were studied in this work. Fifty-seven patients treated by ureteral stenting (group I) and 81 patients were treated by other treatment modalities (group II). Renal glomerular filtration rate (GFR) was used as an indicator for improvement of renal function after fixation of ureteric stent. In group I, 56 (71.8%) kidneys showed significant recovery compared to 61 kidneys (66.3%) in group II [Table 1].

There is a significant increase in the mean post-operative GFR than that of preoperative one ($P < 0.0001$) using paired-samples *t*-test which signifies that the relief of obstruction improves the base line GFR using linear regression to test the predictivity of preoperative GFR as univariate factor we found that there is a statistically significant linear regression between preoperative GFR and recoverability ($P < 0.0002$).

Renal perfusion was measured with diuretic renography using Tc99 DTPA. The relationship between recovery and renal perfusion collected is shown in Table 2.

There is statistically significant relation between renal perfusion and renal recovery ($P < 0.004$).

Abdominal ultrasonic revealed: (a) Statistically significant relation between parenchymal thickness and recovery in both groups ($P < 0.0002$) as in Table 3. (b) Also there was statistically significant relation between degree of

Table 1: The mean glomerular filtration rate of obstructed kidneys and recovery

	Group I		Group II	
	Sig. recovery	No recovery	Sig. recovery	No recovery
Number (%)	56 (71.8)	22 (28.2)	61 (66.3)	31 (3.7)
Preoperative GFR±SD	28.2±13.9	11.8±9.2	24.6±12.1	10.3±8.1
Postoperative GFR±SD	43.3±22.2	8.9±7.04	37.8±19.4	7.8±6.1

GFR: Gomerular filtration rate

Table 2: Relation between renal perfusion and recovery

Renal perfusion	Group I				Group II			
	Sign. Rec.		No Rec.		Sign. Rec.		No Rec.	
	No. of kidneys	%	No. of kidneys	%	No. of kidneys	%	No. of kidneys	%
Good	31	55.4	1	4.5	30	49.2	2	6.5
Moderate	19	33.9	6	27.3	23	37.7	6	19.3
Poor	6	10.7	15	68.18	8	13.1	23	74.2
Total	56	100	22	100	61	100	31	100

Table 3: Relation between parenchymal thickness and recovery

	Group I		Group II	
	Sig. recovery	No recovery	Sig. recovery	No recovery
Number (%)	56 (71.8)	22 (28.2)	61 (66.3)	31 (33.7)
Mean preoperative thickness mean±SD	13.4±4.8	5.6±5.5	13.7±4.6	5.4±5.2
Mean postoperative thickness mean±SD	13.7±4.7	5.7±4.9	13.8±4.5	5.6±4.3

corticomedullary differentiation and recovery ($P < 0.0003$). Good corticomedullary differentiation associated with more recovery after relief of obstruction. Serum creatinine and blood urea on presentation and after relief of obstruction showed that there is no statistically significant relation between preoperative blood urea and serum creatinine levels and recoverability in both groups as shown in Table 4.

Hemoglobin (Hb) level was determined at the time of presentation and post operative after relief of obstruction and statistical analysis was done as shown in Table 5.

There was a statistical significant relationship between hemoglobin levels at presentation and the recoverability ($P < 0.002$). So good (Hb) level at presentation associated with high rate of recoverability.

DISCUSSION

Obstructive uropathy refers to the functional or anatomical obstruction of urinary flow at any level of the urinary tract. Obstructive nephropathy is present when the obstruction causes functional or anatomic renal damage.[3,7] Ureteral stenting is an important procedure for the release of obstruction, but the indications for stent insertion should be carefully considered in each patient.[5,8]

For prediction of recovery of renal function after stenting, clinical assessment, laboratory investigations, renal ultrasonography, diuretic renography should be the follow-up parameters.[9] In our study, there were a significant increase of the mean total GFR and mean single GFR in all patients after relief of obstruction. There were a statistically significant relation between the recoverability of the obstructed kidney after relief of obstruction and pre-operative GFR, parenchymal thickness, size of the kidney, parenchymal echogenicity, corticomedullary differentiation, renal perfusion, presenting hemoglobin and hematocrit value. These predictors are comparable to study of Mokhmalji *et al.*, 2001.[10,11]

Table 4: The serum creatinine and blood urea

Blood urea/serum creatinine	Group I Sig. recovery	Group II Sig. recovery
Preoperative		
Mean blood urea±SD	92.9±33.3	102.19±38.92
Mean serum creatinine±SD	5.92±2.57	6.86±2.97
Postoperative		
Mean blood urea±SD	52.10±14.81	60.34±14.81
Mean serum creatinine±SD	2.73±1.66	3.17±1.93

Table 5: Relation between hemoglobin level and recovery

Hemoglobin	Group I		Group II	
	Sig. recovery	No recovery	Sig. recovery	No recovery
Pre-operative mean Hb±SD	11.8±2.94	8.4±2.21	12.1±3.12	7.9±2.15
Post-operative mean Hb±SD	12.3±3.13	8.6±2.41	11.7±2.71	8.1±2.61

Also in our series, there is no statistically significant correlation between the pre-operative serum creatinine level, blood urea and the recoverability potential. So the pre operative serum creatinine and urea bilaterally obstructed patients cannot predict the post operative outcome which is consistent with the study of Leahy *et al.*, 1989.[12] In our series there was a statistical significant relationship between hemoglobin levels at presentation and the postoperative recovery ($P < 0.002$). The higher the hemoglobin level on admission the better will be the response postoperatively. High hemoglobin level at presentation proved previously to indicate good prognosis of acute conditions and good recoverability of renal function following relief obstruction.[13] Similarly the higher hematocrit level at presentation proved to offer a good prognosis for recoverability in obstructive uropathy. In our study there was statistical significant relationship between hematocrit levels at presentation and post operative recovery ($P < 0.004$) the higher the haematocrite level at presentation, the better will be the response postoperatively and this is consistent with study of Kasiske and Kjellstrand 1983.[14]

Parenchymal thickness is one of the most promising factors that affect the recovery and this is in accordance with the finding of Kitamura 1989, who found a close linear correlation between the parenchymal thickness before preliminary nephrostomy and the renal function after the nephrostomy.[15] The same results in our study revealing statistical significant relationship between the presenting renal parenchymal thickness and the post deobstruction recovery. The same conclusion was done by Zayed 1996, who estimated that the presence of >1 cm of parenchyma is a good prognostic parameter.[16] Belis *et al.* 1982 recommend that in hydronephrotic kidneys the parenchymal thickness is irregular and measuring it at one or more points does not reflect the true amount of remaining nephrons.[17] Therefore measuring the whole volume of the renal parenchyma by U.S. CT or MRI may be beneficial in the context predicting recoverability of renal function in obstructive uropathy.[18,19] Also the finding of grade of echogenicity of the renal parenchyma give an indicator about potential recoverability and there is statistical significant relation between grade of echogenicity and the post operative recoverability the normal the renal echogenicity the better well be the recovery of renal function after treatment of obstructive uropathy. On the other hand Taha *et al.*, 1988 reported that ultrasonography, radionuclide imaging and CT scan were not found to be reliable in predicting whether these kidneys were potentially recoverable.[20]

The corticomedullary differentiation is more accurate and

interpretable in pediatric patients but also in adults it can be helpful in diagnosis of parenchymal scarring. In our study there is statistical significant correlation between corticomedullary differentiation and post operative recovery.[21]

In our study the renal perfusion of obstructed kidney found to be associated with recoverability of this kidney so it is a good predictor of recovery, the same correlation was concluded by Belis and coworkers 1982 who had concluded that patients with renal cortical blood flow present on a 99m Tc-DTPA scan have the potential for partial recovery of function in the chronically obstructed kidney.[17] It is known that there is a correlation between the renal perfusion and recoverability of obstructed kidney.

CONCLUSIONS

Ureteral stenting can be used as minimally invasive procedure for relief of obstructive uropathy in patients with poor general conditions. It can be prior to any pelvic radiotherapy or major pelvic surgery can prevent obstructive uroapthy and ureteral injury.[22] The predictors of renal recoverability revealed that ureteral stents alone can help in regaining renal function and significant improvement of clinical condition in patients with obstructive uropathy.

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How to cite this article: Shehab M, El Helali A, Abdelkhalek M, Abdelshafy M, Mourad M, El Helaly H, *et al*. Role of ureteric stents in relieving obstruction in patients with obstructive uropathy. Urol Ann 2013;5:148-51.

Source of Support: Nil, **Conflict of Interest:** None.