Evaluation of Surgical Intervention and Its Predictive Factors in Patients with Chronic Obstructive Renal Failure

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Abstract: Objective: To evaluate results of surgical intervention in patients with chronic obstructive renal failure. We will try to assess some of the factors that may predict favorable outcomes.

Patients and methods: Eighty six patients diagnosed clinically as having chronic obstructive renal failure (53 men 61.63% and 33 women 38.37% ranging in age between 25 and 69 years, mean 47 years) in the period from September 2010 to August 2012.

The patients on this study were divided according to past history of renal impairment and/or regular dialysis into two groups as follow: ***Group (A):*** Patients with chronic renal failure with no regular dialysis (46 patients) Males: 28 (60.86%) Females: 18 (39.14%). ***Group (B):*** Patients with chronic renal failure with regular dialysis (40 patients) Males: 25 (62.5%) Females: 15 (37.5%). All patients have been evaluated according to the protocol of obstructive uropathy. Clinically most patients presented by anuria 28 (32.65%) patients (16 group A and 12 group B), oliguria 25 (29.07%) patients (13 group A and 12 group B), loin pain 40 (46.5%) patients (25 group A and 15 group B), nausea and vomiting 29 (33.72%) patients (12 group A and 17 group B). 58 Patients underwent direct intervention and 28 patients were managed by temporary drainage until improvement of the general condition then definitive surgical procedure. **Results:** In our series patients with chronic obstructive renal failure (group A), showed improvement in 33 patients (71.74%), equivocal improvement in7 patients (15.21%) and did not improve in 6 patients (13.04). Out of the 6 patients who did not improve after management 2 patients (4.35%) remained unchanged and 4 patients (8.68%) continued to have progressive renal failure up to regular dialysis. In patients with chronic obstructive renal failure (group B), renal functions showed different degrees of improvement as follow: In 14 patients (35%) good improvement and subsequent complete weaning from dialysis occurred, while in 16 patients (40%) there was a decrease in weekly dialysis sessions from 3 to 2 sessions/week. In the remaining 10 patients (25%) there was no improvement and patients continued to have regular dialysis as preintervention. The overall complications in this series were (12.79%). The incidence was much more in the chronic cases group B. The mortality rate in our series is (2.33%) which is not high if compared with other series dealing with corrective surgery in obstructive renal failure. **Conclusion:** There is evidence of reversibility of renal function after long standing obstruction which provides justification for efforts to identify and treat urinary tract obstruction even if a patient with an obstruction requires dialysis to avoid the dialysis or kidney transplantation or helping patients under dialysis for complete weaning form dialysis or decrease their number of weekly sessions, and in all cases the risk of the procedures should be weighed against the chances of improvement .

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1. Introduction

Renal insufficiency describes a measurable reduction in renal function with normal serum biochemical values. Renal failure is an advanced stage of renal insufficiency in which renal function deteriorates to the extent that homeostatic mechanisms are impaired and serum biochemical parameters are disturbed ***(Dooley and Mazze, 1996).***

Obstructive uropathy refers to the functional or anatomic obstruction of urinary flow at any level of the urinary tract. Obstructive nephropathy is present when the obstruction causes functional or anatomic renal damage ***(Vernon et al., 2007).***

The diagnosis of obstruction as the cause of renal failure is important, as it is correctable. Relief of such obstruction may cure acute renal failure due to post-renal etiology or convert the situation in cases of chronic renal failure from advancing progressive disease to stable renal insufficiency compatible with comfortable life ***(Mathew, 1996).***

Having preoperative predictors of renal recovery may ensure optimal patients selection, reducing the number of procedures and economic burden on the patient who does not require intervention ***(Ramanthan et al., 1998).***

2. Patients and Methods

This prospective study was conducted at Al-Azhar University Hospitals. The study included 86 patients clinically diagnosed as having chronic obstructive renal failure (53 men 61.63% and 33 women 38.37% ranging in age between 25 and 69years, Mean ±SD 47 years) in the period from October 2007 to January 2012. The patients in this study were divided into two groups as follow:

Group (A): Patients with chronic renal failure with no regular dialysis (46 patients) Males: 28 (60.86%) Females: 18 (39.14%).

Group (B): Patients with chronic renal failure with regular dialysis (40 patients) Males: 25 (62.5%) Females: 15 (37.5%).

Preoperative evaluation:

All patients underwent the following preoperative evaluation in the form of:

A- Clinical assessment:

1- Full medical history

2- Complete general and urologic examination.

Including systemic, abdominal, perineal, digital rectal examination in males and vaginal examination in females.

B- Laboratory investigations: These included:

Complete urine analysis, urine culture and sensitivity in presence of urinary tract infection guided by colony count > 100,000 micro organism/ ml, Creatinine clearance, Fluid input /24 hours, Urine output /24 hours, Blood chemistry with special request for: Serum creatinine, Serum sodium (Na), Serum potassium (K) and Serum bicarbonate (HCO3).

C- Imaging studies

a- Plain X-ray urinary tract (PUT): PUT was done to all the patients.

b- Abdominal ultrasonography (US):

Abdominal US was carried out in all patients. It had a special value for those who had chronic renal insufficiency. Ultrasonography was done with special request for measuring the paranchymal thickness, grade of echogenicity, corticomedullary differentiation and the degree of hydronephrosis.

c- Diuretic renography:

Technetium-99m diethylenetriamine penataacetic acid (^{99m}Tc DTPA) was used for diuretic renography according to the standard protocol with 40 mg of furosemide injected 20 minutes after injection of the radiotracer. Half-time drainage was calculated using computer generated curve and the GFR was calculated by the accumulated tracer in the kidney between 2 and 3 minutes after radiopharmaceutical injection. Sequential images were obtained by gamma camera computer system.

Obstructive response was considered when after collecting system filling and furosemide administration, the collecting system activity kept rising, peaked and remained at this level, or the half time clearance of radionuclide was greater than 20 minutes.

***d- Magnetic resonance urography (MRU)*:**

MRU was done to some patients who had no clear cause of hydronephrosis to diagnose the possible cause of obstruction.

Treatment:

1- Preliminary Procedures

A- Preintervention percutaneus nephrostomy (PCN) fixation

Eighteen patients (20.93%) 10 cases (21.74%) of group A and 8 patients (20%) of group B underwent preliminary ultrasonic guided percutaneous nephrostomy (PCN).

B- Preintervention dialysis

Preintervention dialysis was performed urgently to 10 patients of group A and all patients of group B to improve the general condition and physical fitness of those patients for anesthesia and surgery.

2- Definitive treatment

Types of surgical intervention

Some patients receive one type of surgical intervention, but others receive two or more types of surgical intervention together as follow**:**

1- **Ureterolithotomy** was performed to 36 patients {19 group A (41.3%) and 17 group B (42.5%)}.
2- **Pyelolithotomy** was performed to 24 patients {14 group A (30.43%) and 10 group B (25%)}.
3- **Ureteroscopy (URS)** was performed to 18 patients {10 group A (21.74%) and 8 group B (20%)}.
4- **Endoscopic endodilatation** of the lower ureter was performed to 8 patients {5 group A (10.87%) and 3 group B (7.5%)}.

Postoperative follow up

All patients were put under strict clinical surveillance during the early postoperative days with the following assessments performed on day +1 and +3; urine output, serum creatinine, serum electrolytes (K, Na & HCO_3) and blood gases. In addition to PUT and creatinine clearance were performed on day +3.

Late follow up

The duration of follow up ranged from two weeks to six months after definitive procedures. All patients were followed after a period of two weeks and six months by the following: urine analysis with culture and sensitivity test (when indicated), serum creatinine, serum electrolytes (K, Na & HCO_3), creatinine clearance, abdominal ultrasonography (US), diuretic renography and state of redialysis to evaluate the end results of our surgical intervention.

Improvement evaluation

Evident improvement was judged if one or more of the following criteria were fulfilled: Creatinine returned to the normal as matched to the patient's age and gender, creatinine clearance increased by 20 ml/min or more or complete weaning from dialysis occurred.

Equivocal improvement was judged if one or more of the following criteria were fulfilled: Creatinine decreased but still above the normal as matched to the patient's age and gender or the number of weekly dialysis sessions decreased. Otherwise, patients were considered as having no improvement.

3. Results

Improvement

Improvement ratio:

Table (1): The incidence of improvement among the studied groups

Groups	Improvement		
	Good improvement	Equivocal improvement	No improvement
A (n = 46)	33 (71.74%)	7 (15.22%)	6 (13.04%)
B (n = 40)	14 (35%)	16 (40%)	10 (25%)

Prognostic criteria

Age distribution

Table (2): Correlation between age distribution and improvement among studied groups.

	Mean age	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**Age** ≤ 47	22	19 (86.36%)	3 (13.63%)	> 0.05 NS
	Age > 47	24	21 (87.5%)	3 (12.5%)	
Group B (n = 40)	**Age** ≤ 47	18	14 (77.78%)	4 (22.22%)	> 0.05 NS
	Age > 47	22	16 (72.73%)	6 (27.27%)	

2- Sex distribution

Table (3): Correlation between sex distribution and improvement among studied groups.

	Sex	No of patients	Improvement	No improvement	P value
Group A (n = 46)	Males	28	24 (82.14%)	4 (17.86%)	> 0.05 NS
	Females	18	16 (88.89%)	2 (11.11%)	
Group B (n = 40)	Males	25	19 (76%)	6 (24%)	> 0.05 NS
	Females	15	11 (73.33%)	4 (26.67%)	

3- Laboratory investigations

The correlation between preoperative laboratory investigations and improvement among studied groups are shown in tables from 5 to 11.

Table (4): Correlation between preoperative creatinine and improvement among studied groups.

	Mean preoperative creatinine(mg/dl)	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**Cr** ≤ 4	22	19 (86.36%)	3 (13.63%)	> 0.05 NS
	Cr > 4	24	21 (87.5%)	3 (12.5%)	
Group B (n = 40)	**Cr** ≤ 4	19	15 (78.95%)	4 (21.05%)	> 0.05 NS
	Cr > 4	21	11 (71.43%)	6 (28.57%)	

Table (5): Correlation between preoperative creatinine clearance and improvement among studied groups.

	Mean preoperative CcR (ml/min)	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**CcR** ≤ 30	28	24 (82.14%)	4 (17.86%)	> 0.05 NS
	CcR > 30	18	16 (88.89%)	2 (11.11%)	
Group B (n = 40)	**CcR** ≤ 30	23	17 (73.91%)	6 (26.09%)	> 0.05 NS
	CcR > 30	17	13 (76.47%)	4 (23.53%)	

Table (6): Correlation between preoperative K+ and improvement among studied groups.

	Mean preoperative K+	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**K+** ≤ 5	19	17 (89.47%)	2 (10.53%)	> 0.05 NS
	K+ > 5	27	22 (85.19%)	4 (14.81%)	
Group B (n = 40)	**K+** ≤ 5	14	10 (71.43%)	4 (28.57%)	> 0.05 NS
	K+ > 5	26	20 (76.92%)	6 (23.08%)	

Table (7): Correlation between preoperative Na+ and improvement among studied groups.

	Mean preoperative Na+	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**Na+ ≤ 135**	22	20 (90.91%)	2 (9.09%)	> 0.05 NS
	Na+ > 135	24	20 (83.33%)	4 (16.67%)	
Group B (n = 40)	**Na+ ≤ 135**	19	15 (78.95%)	4 (21.05%)	> 0.05 NS
	Na+ > 135	21	11 (71.43%)	6 (28.57%)	

Table (8): Correlation between preoperative HCO_3 and improvement among studied groups.

	Mean preoperative HCO_3	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**HCO_3 ≤ 15**	28	24 (82.14%)	4 (17.86%)	> 0.05 NS
	HCO_3 > 15	18	16 (88.89%)	2 (11.11%)	
Group B (n = 40)	**HCO_3 ≤ 15**	23	18 (78.26%)	5 (21.74%)	> 0.05 NS
	HCO_3 >15	17	12 (70.59%)	5 (29.41%)	

Table (9): Correlation between preoperative UTI and improvement among studied groups.

	preoperative UTI	No of patients	Improvement	No improvement	P value
Group A (n = 46)	Positive UTI	22	19 (86.36%)	3 (13.64%)	> 0.05 NS
	Negative UTI	24	21 (87.5%)	3(12.5%)	
Group B (n = 40)	Positive UTI	20	15 (75%)	5 (25%)	> 0.05 NS
	Negative UTI	20	15 (75%)	5(25%)	

3- U/S findings

A- Parenchymal thickness

Table (10): Correlation between preoperative parenchymal thickness and improvement among studied groups.

	Mean preoperative Parenchymal thickness(mm)	No of patients	Improvement	No improvement	P value
Group A (n = 46)	P. thickness ≤ 10	18	12 (66.67%)	6 (33.33%)	< 0.01 HS
	P. thickness > 10	28	28 (100%)	0	
Group B (n = 40)	P. thickness ≤ 10	29	19 (65.52%)	10 (34.48%)	< 0.01 HS
	P. thickness > 10	11	20 (100%)	0	

B- Corticomedullary differentiation

Table (11): Correlation between preoperative corticomedullary differentiation and improvement among studied groups.

	preoperative Corticomedullary differentiation	No of patients	Improvement	No improvement	P value
Group A (n = 46)	Good	30	30 (100%)	0	< 0.01 HS
	Poor	16	10 (62.5%)	6 (37.5%)	
Group B (n = 40)	Good	14	14 (100%)	0	< 0.01 HS
	Poor	26	16 (61.54)	10 (38.46%)	

C- Parenchymal echogenicity

Table (12): Correlation between preoperative parenchymal echogenicity and improvement among studied groups.

	preoperative Parenchymal echogenicity	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**Normal**	19	19 (100%)	0	< 0.01 HS
	Grade I	20	20 (100%)	0	
	Grade II	7	1 (14.28%)	6 (85.72%)	
Group B (n = 40)	**Normal**	0	0	0	< 0.01 HS
	Grade I	21	21 (100%)	0	
	Grade II	19	9 (47.37%)	10 (52.63%)	

5- Renal isotopic GFR

Table (13): Correlation between preoperative GFR of target kidney and improvement among studied groups.

	Mean preoperative GFR(ml/min)	No of patients	Improvement	No improvement	P value
Group A (n = 46)	GFR ≤ 30	17	11 (58.3%)	6 (41.7%)	< 0.01 HS
	GFR > 30	29	29 (100%)	0	
Group B (n = 40)	GFR ≤ 30	15	5 (33.33%)	10 (66.67%)	< 0.01 HS
	GFR > 30	25	25 (100%)	0	

6- Etiology of obstruction

Table (14): Correlation between etiologies of obstruction and improvement among studied groups.

	Cause of obstruction	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**Calcular obstruction**	27	24 (88.89%)	3 (11.11%)	> 0.05 NS
	Stricture	19	11 (57.89%)	3 (42.11%)	
Group B (n = 40)	**Calcular obstruction**	24	19 (79.17%)	5 (20.83%)	> 0.05 NS
	Stricture	16	11 (68.75%)	5 (31.25%)	

7- Types of intervention

Table (15): Correlation between types of intervention and improvement among studied groups.

	Types of intervention	No of patients	Improvement	No improvement	P value
Group A (n = 46)	**Direct**	26	22 (84.62%)	4 (15.38%)	> 0.05 NS
	Staged	20	18 (90%)	2 (10%)	
Group B (n = 40)	**Direct**	32	24 (75%)	8 (25%)	> 0.05 NS
	Staged	8	6 (75%)	2 (25%)	

Morbidity

Table (16): Incidence of postoperative morbidity among the studied groups.

		Morbidity						
		Bleeding from nephrostomy	**Wound gaping**	**Pyelonephritis**	**Perinephric abscess**	**Myocardial infarction**	**Wound infection**	**Septic shock**
Group A (n = 46)	**Number**	0	0	1	0	0	1	0
Group B n = 40)	**Number**	2	1	1	1	1	2	1
P value		0.0001 (HS)						

4. Discussion

The main step in the treatment of obstructive renal failure is drainage. Drainage of the obstructed tract could be as simple as catheter drainage of the bladder or a definitive operation to remove the cause of obstruction. Intermediate steps as bypassing ureteric obstruction by a catheter or proximal diversion by percutaneous nephrostomy (PCN) have their indications. However an initial medical treatment may be required particularly in cases of advanced degrees of renal failure where hypervolemia, hyperkalemia and acidosis may necessitate appropriate treatment. In severely affected patients (urgent cases) we tried to relief obstruction by simple short procedure as many patients in this group were had poor general conditions and this agree with *Mokhmalji et al. (2001)* who recommended that before any procedure patients must be euhydrated, controlled electrolytes and acid base balance.

The replacement therapy with fluids, electrolyte and acid base monitoring after stenting are very essential for uremic patients to compensate post obstructive diuresis and this was recommended by *Gulmi et al. (1995).*

In patients with chronic obstructive renal failure, the major goals were to establish euvolemia, to correct hypertension, hyperkalemia and acidosis to minimize the uremic bleeding tendency. Dialysis could be utilized to prepare the patient for definitive treatment. In this work dialysis was performed urgently preoperative to 10 patients of group A and all patients of group B to improve the general condition and physical fitness of those patients for anesthesia and surgery.

Direct definitive intervention in this work was applicable in 58 (67.44%) patients 26 (44.83%) of group A and 32 (80%) patients of group B. Staged treatment was done in 28 (32.56%) patients 20 cases (43.48%) of group A and 8 patients (20%) of group B. We tried to compare the results of direct intervention with staged intervention as regards recovery of renal function. No significant difference was noticed between both types of intervention either in patients with chronic obstructive renal failure.

Improvement

In 1982 Singh et al. reported renal function improvement in 86%, while 6% showed no improvement and they were given regular dialysis after surgical management of 50 patients with renal and ureteric calculi and renal failure (31 acute renal failures and 19 chronic renal failures).

In 1985 Gupta et al. reported renal function improvement in 40 patients (67.8%), 8 cases (13.6%) showed no improvement and 11 cases (18.6%) continued to have progressive renal failure in management of 59 patients with renal and ureteric calculi presented with chronic renal failure.

In 1992 Cohen et al. reported that relief of obstruction in 3 patients with end stage renal disease led to discontinuation of dialysis.

In 2001 Gharbi et al. reported improvement of renal function in 16 (58%) cases with acute obstructive renal failure, remained unchanged in 6 (21%) and 3 cases (10.5%) continued to have progressive renal failure.

Witheraw and Wickham (2003) reported different degrees of improvement in 17 cases (89.5%), 2 cases (10.5%) remained stable, while no patient required long term dialysis after nephrolithotomy on 19 patients with chronic renal failure.

In 2004 Goel et al. reported improvement of renal function in 18 (90%) cases with chronic renal failure, and nephrolithiasis, remained unchanged in 1 (5%) and 1 case (5%) continued to have progressive renal failure.

In our series patients with chronic obstructive renal failure (group A), showed improvement in 33 patients (71.74%), equivocal improvement in7 patients (15.21%) and did not improve in 6 patients (13.04). Out of the 6 patients who did not improve after management 2 patients (4.35%) remained unchanged and 4 patients (8.68%) continued to have progressive renal failure up to regular dialysis. In patients with chronic obstructive renal failure (group B), renal functions showed different degrees of improvement as follow: In 14 patients (35%) good improvement and subsequent complete weaning from dialysis occurred, while in 16 patients (40%) there was a decrease in weekly dialysis sessions from 3 to 2 sessions/week. In the remaining 10 patients (25%) there was no improvement and patients continued to have regular dialysis as preintervention.

Morbidity

The overall complications in this series were (13.79%) %. There was significant difference between the incidence of morbidity in patients with chronic renal failure. The incidence was much more in the chronic cases group B.

Bleeding from nephrostomy in this series occurred in 2 patients (2%), while *Singh et al. (1982)* sighted 3 cases (6%) of operative hemorrhage that need blood transfusion. Perinephric collection occurred in 2 patients (2%).

Bedair (1983) reported 4 (5%) cases of septicemia in his series. Catheter problems (obstruction or dislodgement) are the most frequent minor complication met with *(Bedair, 1983; Stables, 2001).*

Stables, (2001) reported that bacteremic reaction occurred in 1.9% after placement of percutaneous nephrostorny.

In this series wound gaping occurred in 1 patient (1.16%) and wound infection in 3 patients (3.48%).

Witheraw and Wickham (2003) reported 2 patients (4%) with delayed wound healing and 4 with wound infection. Delayed wound healing and infection are probably seen more in patients with renal failure. This may result in part from uremic immunosuppression.

Pyelonephritis in this series occurred in 2 patients (2.32%) and perinephric abscess occurred in 1 patient (1.16%). *Gupta et al. (1985)* reported 12 cases (24%) with positive urine culture postoperatively.

Mortality

The mortality rate in our series is (2.32%) which is not high if compared with other series dealing with corrective surgery in obstructive renal failure. *Singh et al. (1982) reported* (8%), *Gupta et al. (1985)* reported overall mortality rate of (17%), while *Witheraw and Wickham (2003)* reported (10.5%).

The urologist must have a high index of suspicion to detect septicemia in patients with obstructive renal failure because uremic patients usually do not have the classic signs of this condition *(Ansong and Smith, 2003).*

In this series septic shock occurred in 1 patient (1.16%) and myocardial infarction occurred in 1 patient (1.16%) after direct surgery in group B. While in group A, no mortality occurs.

This figure is lesser than the figure reported by *Stables (2001)* which was (1.9%) after replacement of percutaneous nephrostomy. However *Bedair (1983)* reported 4 cases (5%), a figure higher than ours

because of the low incidence of infected obstructed systems in our series.

Conclusion

No significant difference was noticed between both types of intervention (direct or staged) as regarding renal improvement in patients with chronic obstructive renal failure under regular dialysis or not.

There was no correlation between the degree of improvement of renal function and the degree of renal failure according to preoperative creatinine clearance, preoperative urinary tract infection, methods of intervention, age, sex, biochemical state of the patient, or to etiology of obstruction in patients with chronic obstructive renal failure under regular dialysis or not.

The degree of improvement of renal function found to be correlated to preoperative residual parenchymal thickness, parenchmal echogenicity, corticomedullary differentiation, and radioisotope GFR.

Finally there is evidence of reversibility of renal function after long standing obstruction which provides justification for efforts to identify and treat urinary tract obstruction even if a patient with an obstruction requires dialysis to avoid the dialysis or kidney transplantation or helping patients under dialysis for complete weaning form dialysis or decrease their number of weekly sessions, and in all cases the risk of the procedures should be weighed against the chances of improvement as renal dysfunction due to chronic obstructive uropathy is not always reversible.

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