

Management of Ureteric calculus renal failure: A cost effective and decision making analysis with and without percutaneous nephrostomy

Mohammad Shahzad Anwar¹, Tariq Ghafoor², Mohammed Tariq¹, Saeed Akhtar Malik³

ABSTRACT

Background: Calculus acute renal failure is a urological emergency. Prompt treatment in the form of either temporary urinary diversion, or definite treatment can save the patients from developing chronic renal failure. **Objectives:** To compare the management of patients with obstructive uropathy with and without percutaneous nephrostomy. **Patients & methods:** A prospective interventional study conducted at SIMS/ SZMC, 2007-10. Twenty patients of ureteric calculus presenting with acute renal failure were included in our study. Patients were divided into two groups. Age, sex, duration of anuria and biochemical profile like serum creatinine and serum potassium levels were noted in both groups. In group A, a preliminary percutaneous nephrostomy tube was placed as a temporary diversion. On normalization of clinical and biochemical profile, definite treatment in the form of ureterorenoscopy/ lithoclast was performed. In group B, all the patients underwent definite treatment in the form of ureterorenoscopy/ lithoclast without preliminary temporary urinary diversion. The duration of normalization of renal function test, efficacy of URS lithoclast, hospital stay and cost effectiveness in both the groups were noted. **Results:** A total of 20 patients with 75% male & 25% female were included. Duration of anuria in group A was one day in 1 patient and 2-3 days in 6 patients. The duration of anuria in group B was 1-2 days in 8 patients. Mean normalization of serum creatinine level in group A was 5.9 days while it was 5.2 days in group B. The mean hospital stay was 10 days in group A while it was 4.7 days in group B. The mean cost of treatment in group A was Rs.12300 and Rs.4800 in group B. **Conclusion:** In patients with deranged renal functions but otherwise clinically normal can be offered definite treatment without temporary diversion in the form of PCN. This not only decreases the morbidity associated with PCN but also comforts the patients in term of shorter hospital stay and cost effectiveness.

Key words: Calculus anuria, Percutaneous nephrostomy, Ureterorenoscopy/lithoclast

INTRODUCTION

Urolithiasis is one of the oldest and commonest disease of upper and lower urinary tract. A very high incidence is reported in Pakistan, especially in southern Punjab.^{1,2} Patients with obstructive uropathy present with colic, hematuria, oliguria and anuria. In Western countries, stone as a cause of renal failure is not very common, while in Pakistan, the incidence of calculus renal failure is very high.^{3,4,5} Obstructive uropathy with resultant hydronephrosis is the eventual outcome of stone disease in most cases, leading to partial or complete structural changes in the kidney.

Acute renal failure due to calculus disease is a urological emergency. Management in the form of percutaneous nephrostomy, acute peritoneal dialysis, haemodialysis and definite surgical treatment like uretero-rensoscopy with lithoclast, ESWL (Extracorporeal Shock Wave Lithotripsy) and open ureterolithotomy can save the patient from developing chronic renal failure. In this

study, we compared the management of calculus ureteric renal failure with and without percutaneous nephrostomy, especially in terms of hospital stay and cost effectiveness.

PATIENTS AND METHODS

A prospective interventional study conducted at Services Institute of Medical Sciences Lahore and Sheikh Zayed Medical College, Rahim Yar Khan, 2007-10. Twenty patients of both sexes were included in this study. Children less than 12 years of age and patients with upper ureteric stones were excluded from our study. The patients were divided into two groups. In both groups, patients with history of anuria, oliguria, other symptoms suggestive of obstructive uropathy with deranged renal function tests (RFTs), lower or mid ureteric stones either unilaterally or bilaterally, were included. Patients with uremic symptoms like nausea, vomiting, breathlessness, facial and pedal swelling, ascites and deranged biochemical profile especially were included in group A. In these patients, percutaneous nephrostomy (PCN), either unilaterally or bilaterally, were placed initially under local anesthesia and ultrasound guidance. Patients remained admitted in the hospital till the normalization of clinical as well as biochemical profile. After achieving normal RFTs, patients were operated under general or spinal anesthesia. Standard 9 F&10 F Ureterorenoscope

1. Department of Urology, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan.

2. Department of Surgery, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan.

3. Department of Radiology, SZMC, Rahimyar Khan

Correspondence: Dr. Mohammed Shahzad Anwar
Assistant Professor Urology, Sheikh Zayed Medical College/Hospital, Rahim Yar Khan.

E.mail: shahzaduro@gmail.com

Cell No: 0300-9429169

URS (STORZ & WOLF) 435cm with 5F working channel with lithoclast was used. Fragmentation of stone upto 2-4mm was the goal of treatment. Initially a guidewire was placed, then subsequently URS was introduced and finally stone was broken by using lithoclast. To prevent stone migration balloon catheter or dormia basket is used. As we did not have these facilities available in our setup, these were limitations in our study. Double J (DJ) stent was placed in all cases and all the patients were catheterized. Foley catheter was removed on the first post operative day and DJ stent was removed during the third week. In group B, only those patients were included who gave history of anuria, oliguria or symptoms suggestive of obstructive uropathy with deranged RFTs due to lower or mid ureteric stones either unilaterally or bilaterally but were otherwise normal regarding general and systemic examination with normal serum potassium. Percutaneous nephrostomy was not placed. Rather patients were operated under spinal anesthesia for URS lithoclast.

In both groups duration of anuria, clinical and biochemical profile, duration of the definite procedure, complications, efficacy, duration of hospital stay and cost of treatment were noted. The data was collected and analyzed in SPSS version 16.

Table:1 Age of Patients
Total number of patients 20

Group A (10)		Group B (10)	
Age range	No of Patients	Age Range	No of Patients
21-30	3	21-30	5
31-40	2	31-40	3
41-50	4	41-50	1
51-60	1	51-60	1

Table:2
Bio Chemical Profile of Patients in both groups

Total no. of patients 20		
	Group A (10)	Group B (10)
Creatinine levels	No of Patients	No of Patients
5-7 mg/dl	3 (30%)	7 (70%)
8-10 mg/dl	6 (60%)	3 (30%)
>10 mg/dl	1 (10%)	0 (0%)
Serum Potassium Levels		
With in normal limits	3 (30%)	10 (10%)
> Normal limit	7 (70%)	0 (0%)
Hb gm%		
<8	3 (30%)	0 (0%)
8-10 gm	2 (20%)	1 (10%)
10-12 gm	5 (50%)	7 (70%)
> 12 gm	0	2 (20%)

Table 3
Site of Stone on X-ray KUB/Ultrasound

	Group A		Group B		
	Total No of Patients (10)	Level of ureteric obstruction	Total No of Patients (10)	Level of ureteric obstruction	
Bilateral Ureteric Stones	6 (60%)	Mid Ureter	Bilateral Ureteric Stones	Mid Ureter	2
		Lower ureter		7	Lower ureter
Unilateral Ureteric Stones	4 (40%)	Mid Ureter	Unilateral Ureteric Stones	Mid Ureter	0
		Lower ureter		3	Lower ureter

Mid ureteric stones in Group A = 6
Lower ureteric stones in Group A = 10
Mid ureteric stones in Group B = 2
Lower ureteric stones in Group B = 13

Total Mid ureteric stones = 8
Total lower ureteric stones = 23

RESULTS

Twenty patients of both sexes were included in our study. Age range in group A and group B is shown in Table 1. Mean age in group A was 38 (± 1 SD) while mean age in group B was 34 (± 1 SD). There were 7 (70%) males and 3 (30%) females in Group A, while 8 (80%) males and 2 (20%) females in group B. The duration of anuria in group A was one day in 1 patient and 2-3 days in 6 patients. Similarly, the duration of anuria in group B was 1-2 days in 8 patients. In group A, six patients with anuria had bilateral ureteric stones, while in 1 (10%) patient the anuria was due to unilateral ureteric stone. 3 (30%) patients in group A presented with oliguria (urine output less than 300 ml/24 hours) having unilateral ureteric stones. In group B, 5 (50%) patients with anuria were with bilateral ureteric stones and 3 (30%) patient were with unilateral ureteric stones. 2 (20%) patients with unilateral ureteric stones presented with oliguria. Biochemical profile regarding creatinine levels, serum potassium and hemoglobin levels of both groups are shown in Table 2. According to the site of stone, as determined on ultrasonography and X-ray KUB (plain) in group A, six were with mid ureteric stones and ten with lower ureteric stones, while in group B there were two mid ureteric stones and thirteen lower ureteric stones. Overall, 8 mid ureteric stones and 23 with lower ureteric stones (Table 3). In patients with placement of PCN, either unilaterally or bilaterally, wound infection was seen in 2 patients and hematuria in 3 patients. PCN was accidentally removed in 2 patients, which were reinserted later on. Mean normalization of serum creatinine level in group A after PCN was 5.9 days, while it was 5.2 days in group B. Regarding complications of URS/

lithoclast, in group A, stone was pushed back into the kidney in two patients. In group B, the stone was pushed back in one patient while in two patients the procedure failed due to hard stone and difficulty in the insertion of URS. In these two cases, open ureterolithotomy was performed. The success rate of URS lithoclast was 80% in group A and 70% in group B with overall success rate being 75%. In group A, the duration of URS lithoclast with DJ stenting was one hour and 45 minutes in 5 patients while in 3 patients it was 50 minutes. In group B, the mean duration of procedure was one hour and 45 minutes in 4 patients with bilateral ureteric stones and one hour in 4 patients with unilateral ureteric stone. The hospital stay in group A was 7 to 10 days in 7 patients and 11 to 15 days in 3 patients with 10 days mean hospital stay. In group B the duration of hospital stay in 7 patients was 3-5 days and in 3 patients it was 3-5 days with mean 4.7 days. Cost of treatment including cost of DJ stent, cost of PCN sets and miscellaneous items in group A was Rs. 13 to 15 thousand in 6 patients and Rs. 8 to 12 thousand in 4 patients with mean cost of treatment Rs. 12300. In group B the mean cost of treatment was Rs.4800.

DISCUSSION

Calculus anuria is an emergency. It can be due to either bilateral ureteric impaction or unilateral ureteric obstruction in either solitary kidney or the only functioning kidney. Calculus anuria causes increase in intra pelvic pressure and leads to significant renal damage. Prompt and early management is required to save the patient from developing chronic renal failure. In well equipped centres, the ideal treatment of patients with calculus anuria is immediate definite treatment. Zhongua et al 1997⁶ performed emergency operations without temporary urinary diversion. Similarly, Janing et al 2008⁷ performed uretero-renoscopy and holmium laser intra-corporeal lithotripsy as emergency treatment in patients with impacted ureteric calculi. In one study by Ammanullah et al 2010³, preliminary urinary diversion was done in all cases. In our study, 75 % were male and 25% were female. The male predominance is seen in other studies like the one conducted by Fashiuddin Q et al 2008⁸ with 74 % male and 26 % females. The duration of anuria in

our study in both groups was 1-3 days and the mean normalization of serum creatinine in patients after the placement of PCN was six days, while without PCN it was 5.2 days. In a study, Arif Qayum et al 2005⁹ analyzed that patients who came within five days of anuria had better results than those who came late. Prognosis of patients with greater than 10 days of anuria was poor. This is due to prolonged obstruction leading to irreversible damage to the renal parenchyma.

Tatrani et al 1987¹⁰ reported that maximum improvement in serum creatinine level after release of obstruction was in 2-14 days. So, it is observed that earlier the obstruction is relieved, either temporarily or permanently, earlier the normalization of renal function test is attained leading to less damage to renal parenchyma. Percutaneous nephrostomy is commonly performed to relieve urinary obstruction.¹¹ Although percutaneous nephrostomy placement is a widely accepted and safe procedure, potentially serious complications may occur, including severe bleeding, injury to the adjacent organs (bowel, liver, spleen) and pleuropulmonary complications.¹² No major complications of percutaneous nephrostomy were observed in our patients.

The overall success rate of ureterorenoscopy/lithoclast in both the groups was 75%. Stone migration in the kidney during URS was seen in 3(15%) patients. In a study conducted by Mugia et al 2006¹³, the overall success rate was 87%. In an other study by Park et al 1998¹⁴ the stone clearance was 87.8%. In both these studies, ureteric occlusion balloon catheter were used to prevent proximal migration of stone. In one study conducted by Drimi et al 2006¹⁵ ureteric balloon catheter and dormia basket were used to prevent stone migration. Due to limitations in our study, our stone migration rate was 15% and overall success rate was 75%. The mean hospital stay in group A patients was 10 days while it was 4.7 days in group B. The longer duration of hospital stay in group A was due to temporary diversion with PCN. The longer duration of hospital stay also affected the cost of treatment. There was a significant difference in the cost of treatment in both the groups.

In the end we conclude that although percutaneous nephrostomy is a life saving procedure in calculus renal failure, its complications and longer hospital

stay adds to the morbidity and financial constraints for the patients. In patients with deranged renal functions but otherwise normal clinically can be offered definite treatment without temporary diversion in the form of PCN. This not only decreases the morbidity associated with PCN but also comforts the patients in term of shorter hospital stay and cost effectiveness.

REFERENCES

1. Khan FA. History of calculus disease of urinary tract. J Pak Med Assoc 1973;23:1924
2. Khan FA. Basic data on urinary stones in Pakistan. Bulletin 1979;12:79-87
3. Amanullah et al. Calculus anuria and its remedy. J Ayub Med Coll Abbottabad 2010; 22(1)
4. Akhtar MS, Akhtar FK. Utility of the lithoclast in the treatment of upper, middle and lower ureteric calculi. Surg JR Coll Surg Edinb Irel, 2003;144-148
5. G.M.Subhani et al. Outcome of Retrograde Ureteroscopy for the Management of Ureteric Calculi: Four years experience. A.P.M.C Vol: 3 No.1, 2009; 3(1)
6. Sun Z, Wei E, Wang Y. Diagnosis and treatment of postrenal acute renal failure. Zhonghua Wai Ke Za Zhi 1997;35:501-3
7. Janing H, Wu Z, Dign Q. Ureteroscopy and holmium yag laser as emergency treatment for acute renal failure caused by impacted ureteral calculi. Urology 2008;72:504-7
8. Fasihuddin Q, Hasan AT. Ureteroscopy (URS): an effective interventional and diagnostic modality. J Pak Med Assoc. 2008;52:510-2
9. Arz O, Mahmood SA, M.F AM, MSR, AAS, RAJ. Calculus related acute renal failure, management strategies, J Esculapio. 2005;1 (1).
10. Tataranni G, Farinelli R, Zaragli G. Tubule recovery after obstruction uropathy relief: The value of enzumonia and microprotien. J Urol 1987; 138:24-27
11. Farrell TA, Hicks MR. A review of radiologically guided percutaneous nephrostomis in 303 patients. J Vasc Inter Radiol 1997;8:769-74
12. Brown JM, Denbow N, Glickman MG. International radiology in: Wess RM, George NJR, O' Reilly editors. Comprehensive urology London: Mosby; 2001; 149-59
13. Mugiya S, Ozono S, Nagata M, Takayama T, Nagai H, Retrograde endoscopic management of ureteral stones more than 2cm in size. Urology 2006;67:1164-8.
14. Park H, Park M, Park T. Two years experience with ureteral stones: Extracorporeal shock wave lithotripsy v ureteroscopy manipulation. J Endourol. 1998;13:501-4
15. Drimi A, Tekis MI, Aytakin C, Peskircioglu L, Boyvot F, Ozakardestl. URS treatment of Proximal Ureter Stones with the aid of an antegrade occlusion ballon catheter Acta Radiol 2006 Feb; 47 (1): 103-6



Prophet Mohammed (Peace be upon Him)

He is not strong and powerful, who throws people down, but he is strong who withholds himself from anger.