Original Article

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Obstructive Uropathy with Renal Failure

Internal Medicine Section

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ABSTRACT

Introduction: Renal failure is often seen with Urinary Tract Obstruction (UTO), which could be acute or chronic (obstructive nephropathy). With early diagnosis and treatment, it is often reversible. The data being sparse in literature, hence this study was planned.

Aim: The present retrospective study was undertaken to discuss about causes, pathophysiology, site of obstruction, clinical features, diagnostic tests, management and factors affecting renal failure outcomes in cases of obstructive uropathy.

Materials and Methods: All outpatient and inpatient cases of obstructive uropathy in 2016 were included and were subjected for renal function tests, radiological investigations. Stenting, diversion surgeries were performed to relieve obstruction. Student's t-test, Levene's test, chi-square/Fisher Exact-test were used for statistical analysis.

Results: Of the 107 patients enrolled, bilateral UTO, intrinsic cause, chronic obstruction (>3 months duration), acute on Chronic Kidney Disease (CKD), Acute Kidney Injury (AKI), most common site of obstruction was ureter, seen in 58 (54%), 78 (72%), 71 (66%), 63 (58%), 44 (41%) and 47 (43%) cases respectively. Among co-morbities, history of past Urinary Tract Infection (UTI), past urological surgeries and diabetes mellitus were seen in 70 (65%), 62 (57%), and 62 (57%) cases respectively. Among the aetiology, blood clots, abdomen lymphadenopathy, ureter calculus were seen in 62 (57%), 16 (15%), and 14 (13%) cases respectively. Most common symptom was pain abdomen present in 98 (91%) cases. Among the complications, UTI was seen in 65 (60%). Dialysis therapy and most common urological intervention, ureter stenting was needed in 38 (35%) and 37 (34%) cases respectively. Renal failure recovery, post obstructive diuresis, death were noted in 34 (31%), 25 (23%) and 18 (16%) cases respectively.

Conclusion: Comparing with renal failure recovered group, the non recovered group had statistically significant dominant males, were much older, had higher incidence of congenital blocks, acute on CKD, Pelvi-Ureter Junction (PUJ) obstruction, blood clots, abdomen lymphadenopathy, weight loss, abdomen mass, mineral bone disorder, emphysematous Acute Pyelonephritis (APN), lower haemoglobin, leukocytosis, dialysis need and Extracorpeal Shock Wave Lithotripsy (ESWL) therapy.

Keywords: Acute, Dialysis, Ureter, Urinary tract infection

INTRODUCTION

Renal failure is often seen with UTO, which is then termed as obstructive nephropathy [1]. Obstruction can be anywhere in urinary tract leading to damage to renal parenchyma [2]. In a review of 59064 autopsies, UTO was found in 3.1%. Under the age of 10 years, principal causes of UTO were ureteral, urethral strictures or neurological abnormalities. In adults beyond 20 years, uterine malignancies and pregnancy were more common causes of UTO [1,3]. In elderly, prostatic hypertrophy and prostate malignancy were common causes of UTO [3]. UTO can be acute or chronic [4]. Causes like urolithiasis, blood clots cause acute UTO, whereas prostatomegaly, urological malignancies, Retroperitoneal Fibrosis (RPF), congenital obstruction causes chronic UTO [5]. AKI is noted in <5% of UTO [6,7]. Obstructive uropathy accounts for 16% of CKD in children [4,8]. In elderly males, prostatic disorders are major cause of obstructive uropathy contributing to 5% of end stage renal disease [9]. Bilateral UTO is seen in bladder outlet obstruction, urethral lesion. Unilateral UTO is seen in obstruction at pelviureter junction, ureter, vesicoureter junction. Milder degree of damage occurs in partial blocks or in acute UTO if relieved. Greatest degree of chronicity occurs in obstruction since childhood. With early diagnosis and treatment, it is often reversible. The present study was carried to discuss about cause, pathophysiology, clinical features, management of obstructive nephropathy and factors affecting renal failure outcome.

MATERIALS AND METHODS

Study setting: The present retrospective study was done in Vydehi Hospital, a tertiary care hospital in Bengaluru, India, having an economical, service oriented haemodialysis centre with both nephro-urological services including renal transplantation.

Patient and methods: Medical files of patients with diagnosis of obstructive nephropathy from January 2016 to December 2016 were studied. Data like gender, age, clinical features, laboratory investigations, treatment details, outcome were collected. Factors influencing renal failure and its recovery were analysed.

Objectives

1) To discuss about pathophysiology of obstructive nephropathy.
2) To discuss about cause, pathophysiology, clinical features, management of obstructive nephropathy and factors affecting renal failure outcome.

STATISTICAL ANALYSIS

Descriptive and inferential statistical analysis was carried out in the present study.

Student t-test (two tailed, independent) was used to find the significance between two groups. Levene's test for homogeneity of variance was performed to assess the homogeneity of variance. Chi-square/Fisher Exact-test was used to find the significance of study parameters between two or more groups.

Significance of values were suggested as: Mild significance (p-value: $0.05<p<0.10$), moderate significance (p-value: $0.01<p\leq0.05$), statistical significance ($p\leq0.01$).

Statistical software: The Statistical software SPSS 18.0 was used for the data analysis. Microsoft word and Excel was used to produce graphs, tables.

RESULTS

Among 107 patients with obstructive nephropathy enrolled, 77 (72%) were male and 30 (28%) were females. Median age of presentation was 46.4 years. Bilateral UTO was present in 58 (54%). Intrinsic causes like stricture urethra, posterior urethral valve, blood clots, prostate and urinary bladder malignancy were seen in 78 (72%). Chronic obstruction (>3 months duration) was seen in 71 (66%). Acute on CKD was seen in 63 (58%), AKI was seen in 44 (41%). Renal transplant patients were 11 (10%). Most common site of obstruction was ureter in 47 (43.9%) [Table/Fig-1]. Among co-morbities, history of UTI, urological surgeries, and diabetes mellitus were seen in 70 (65%), 62 (57.9%), and 62 (57%) of cases respectively. Among the aetiology, commonest cause was blood clots seen in 62 (57%), followed by abdominal lymphadenopathy in 16 (15%) and ureter calculus seen in 14 (13%) cases [Table/Fig-2]. Commonest symptom was pain abdomen in 98 (91.6%) followed by weight loss in 72 (67.3%) and hematuria in 53 (49.5%) cases. Among the complications, UTI was seen in 65 (60%) followed by sepsis in 34 (31.8%) and mineral bone disorder in 13 (12.1%) of cases. Dialysis therapy was needed in 38 (35%). Commonest urological intervention needed was ureter stenting in 37 (34%) followed by percutaneous nephrostomy in 27 (25.2%) and ESWL in 16 (15%) cases. Renal failure recovery was noted in 34 (31%), post obstructive diuresis was noted in 25 (23%), and death in 18 (16%).

Anatomical site of obstruction	No. of patients (n=107)	%
Pelvi-ureter junction obstruction	15	14.0
Vesico-ureter junction obstruction	2	1.9
Ureter	47	43.9
Urinary bladder	19	17.8
Prostate	12	11.2
Urethra	12	11.2

[Table/Fig-1]: Anatomical site of obstruction distribution of patients studied.

Compared to renal failure recovered group, the non recovered group had statistically significant dominant males, were much older, had higher incidence of congenital blocks, acute on CKD, PUJ obstruction, blood clots, abdomen lymphadenopathy, weight loss, abdomen mass, mineral bone disorder, emphysematous APN, lower haemoglobin, leukocytosis, dialysis need and ESWL therapy. It was also noted there was more incidence of bilateral UTO, chronic obstruction, past UTI episodes in non-recovered group though statistically insignificant [Table/Fig-2,3].

Compared to non-recovered group, recovered group had statistically significant block in urethra, younger age group, stricture urethra, cervical cancer, thin urine stream, irritative symptoms, and underwent more frequently internal urethrotomy, Clean Intermittent Catheterisation (CIC), suprapubic cystostomy.

Aetiology	Renal failure recovered		Total (n=107)	%	p-value
	No (n=73)	Yes (n=34)			
Neurogenic bladder	1 (1.4%)	0 (0%)	1 (0.9%)	0.9	1.000
Myeloma cast nephropathy	3 (4.1%)	0 (0%)	3 (2.8%)	2.8	0.550
Blood clots	47 (64.4%)	15 (44.1%)	62 (57.9%)	57.9	0.048*
Cervical cancer	3 (4.1%)	7 (20.6%)	10 (9.3%)	9.3	0.011*
B/L Staghorn calculi	5 (6.8%)	0 (0%)	5 (4.7%)	4.7	0.176
U/L Renal calculus	8 (11%)	0 (0%)	8 (7.5%)	7.5	0.053+
Ureter calculus	10 (13.7%)	4 (11.8%)	14 (13.1%)	13.1	1.000
Papillary necrosis	6 (8.2%)	2 (5.9%)	8 (7.5%)	7.5	1.000
Stricture urethra	0 (0%)	8 (23.5%)	8 (7.5%)	7.5	<0.001**
Benign prostate hypertrophy	6 (8.2%)	2 (5.9%)	8 (7.5%)	7.5	1.000
Posterior urethral valve	0 (0%)	2 (5.9%)	2 (1.9%)	1.9	0.099+
Tuberculosis	5 (6.8%)	0 (0%)	5 (4.7%)	4.7	0.176
Abdomen lymphadenopathy	16 (21.9%)	0 (0%)	16 (15%)	15.0	0.003**
Lymphocele	6 (8.2%)	0 (0%)	6 (5.6%)	5.6	0.174
Retroperitoneal fibrosis	3 (4.1%)	0 (0%)	3 (2.8%)	2.8	0.550
Urinary bladder cancer	6 (8.2%)	5 (14.7%)	11 (10.3%)	10.3	0.321
Prostatic cancer	6 (8.2%)	1 (2.9%)	7 (6.5%)	6.5	0.427
Ovarian cancer	2 (2.7%)	0 (0%)	2 (1.9%)	1.9	1.000
Renal cell Ca	2 (2.7%)	0 (0%)	2 (1.9%)	1.9	1.000
Peri-renal hematoma	6 (8.2%)	0 (0%)	6 (5.6%)	5.6	0.174

[Table/Fig-2]: Aetiology distribution of patients studied in relation to renal failure recovered.
Chi-Square test/fisher-Exact test
+Suggestive significance (p-value: 0.05<p<0.10)
*Moderately significant (p-value: 0.01<p≤0.05)
**Strongly significant (p-value: p≤0.01)

Treatment	Renal failure recovered		Total (n=107)	p-value
	No (n=73)	Yes (n=34)		
Dialysis Therapy	34 (46.6%)	4 (11.8%)	38 (35.5%)	<0.001**
Nephrolithotomy	11 (15.1%)	1 (2.9%)	12 (11.2%)	0.098+
Ureter stenting	28 (38.4%)	9 (26.5%)	37 (34.6%)	0.229
Nephrostomy tube	20 (27.4%)	7 (20.6%)	27 (25.2%)	0.450
Prostatectomy	9 (12.3%)	1 (2.9%)	10 (9.3%)	0.120
TURBT	6 (8.2%)	5 (14.7%)	11 (10.3%)	0.321
Internal urethrotomy	0 (0%)	10 (29.4%)	10 (9.3%)	<0.001**
ESWL	16 (21.9%)	0 (0%)	16 (15%)	0.003**
PUV Fulgeration	0 (0%)	2 (5.9%)	2 (1.9%)	0.099+
Pyeloplasty	10 (13.7%)	0 (0%)	10 (9.3%)	0.029*
CIC	1 (1.4%)	12 (35.3%)	13 (12.1%)	<0.001**
Orchidectomy	5 (6.8%)	1 (2.9%)	6 (5.6%)	0.662
Suprapubic cystotomy	5 (6.8%)	7 (20.6%)	12 (11.2%)	0.049*
Nephrectomy	8 (11%)	0 (0%)	8 (7.5%)	0.053+
Urinary Diversion	6 (8.2%)	5 (14.7%)	11 (10.3%)	0.321

[Table/Fig-3]: Treatment distribution of patients studied in relation to renal failure recovered.
Chi-Square test/fisher exact-test
TURBT: Transurethral resection of bladder tumour; ESWL: Extracorpeal shock wave lithotripsy; CIC: Clean Intermittent Catheterisation
+Suggestive significance (p-value: 0.05<p<0.10)
*Moderately significant (p-value: 0.01<p≤0.05)
**Strongly significant (p-value: p≤0.01)

DISCUSSION

In obstructive uropathy, there is block in urine flow causing urine accumulation which increases pressure in ureter, renal pelvis and calyces [10]. Acute bilateral block could be at urinary bladder, urethra, ureters like prostatomegaly, nephrolithiasis [1]. Chronic block could be due to prostate enlargement and pregnant uterus. Ureter obstruction could be intraluminal or extraluminal. Intraluminal block could be due to stone, blood clot, sloughed papillae [2]. Extraluminal block could be due to enlarged masses placing pressure on urinary tract like enlarged lymphnodes, tumours [2]. Only 21% of obstructive uropathy are due to primary urological malignancy [11]. Obstruction for more than six weeks results in hydronephrosis leading to renal parenchymal damage. Following release of block, brisk diuresis with volume imbalance, dyselectrolytaemia can be noted [12].

In the present study, 77 (72%) cases were males and mean age was 46±17 years, similar to study on obstructive uropathy by Halle MP et al., wherein, 69% patients were male and mean age was 50±18 years [10]. In the study, commonest cause was blood clots probably related to urolithiasis and malignancies seen in 62 (57%), followed by abdominal lymphadenopathy in 16 (15%) and ureter calculus seen in 14 (13%) cases. This finding was unlike urolithiasis (35%), benign prostatic hypertrophy (27%), prostatic cancer (12%),

cervical cancer (16%) found in Halle MP et al., study and also unlike to more frequently found congenital urethral valves, pelvi-ureteral junction obstruction in study conducted by EL Imam M study [9,10]. Colicky pain is common feature of obstructive uropathy. It was found in 98 (91.6%) cases in this study, unlike 37% and 48% found in Halle MP et al., El Imam M et al., study respectively [9,10]. Difficulty in micturition initiation, incomplete urine emptying, decrease in urine force, post void dribbling are features of lower urinary tract obstruction like prostatic disease [11]. These features were found in 59 (55.1%) cases in present study unlike 39% and 42% found in El Imam M et al., and Halle MP et al., study respectively [9,10]. Palpable kidneys in hydronephrosis are seen [3]. Palpable urinary bladder is in lower urinary tract obstruction [1]. Palpable flank and abdomen mass were seen in 56 (52.3%) cases in the present study.

Acute and chronic obstruction was noted in 41% and 66% cases respectively, similar to that noted in study conducted by El Imam M [9].

Albuminuria indicates glomerular dysfunction [3,7]. Hematuria is seen in calculi and tumour [3,7]. It was found in 53 (49.5%) cases in the present study. Bacteria and leucocytes in urine indicate UTI like pyelonephritis. UTI was found in 65 (60.5%) cases in the present study, unlike 15% cases found in Halle MP et al., study [10].

Primary urological malignancy was found in 20 (18.6%) cases in the present study, unlike 32% cases found in Halle MP et al., study [10].

Plain radiographs detect 90% of radio-opaque calculi [2,5]. Ultrasound is one of the most common tools to evaluate urinary tract obstruction.

Most important step in management is to relieve the block even in malignancy [1,12]. Bladder Outlet Obstruction (BOO) is managed by placing a foley catheter. If catheterisation fails, a Suprapubic Tube (SPT) is placed. BPH would be treated with surgeries such as Transurethral Resection of the Prostate (TURP). Ureteral stent bypasses the narrowed portion of the ureter to effectively drain the kidney. Urinary diversion like percutaneous nephrostomy tubes is an alternate method to drain the kidneys. In MUO, Metallic stents, ureterolysis and ureteral reimplantation can be considered [2,3]. Stones greater than 7 mm requires interventions like ESWL, ureter stents, Nephrostomy (PCN) [8,12]. Urethral strictures require urethrotomy [2]. In the study, UTO was relieved by ureter stenting, percutaneous nephrostomy, TURP, Transurethral Resection of Bladder Tumour (TURBT), ESWL, urethrotomy in 37 (34.6%), 27 (25.2%), 10 (9.3%), 11 (10.3%), 16 (15%), 10 (9.3%) cases respectively, comparable to urinary drainage done in 45% cases seen in Halle MP et al., study [10]. Dialysis therapy was needed in 38 (35%) comparable to 41% and 23% needing dialysis in Halle MP et al., and El Imam M et al., [9,10]. But renal recovery was less, found in 34 (31%) similar to Halle MP et al., and unlike to EL Imam M study respectively probably related to underlying chronic renal disease on presentation in 71 (66%) and also to majority having chronic morbidities like diabetes mellitus, hypertension, past urolithiasis, UTI. Presence of malignancy increases mortality [9,10,13,14]. Death was seen in 16% due to underlying malignancy, sepsis similar to Halle MP et al., and unlike to 5.56%, 0.3% found in Ibrahim AG and EL Imam M et al., studies respectively [4,9,10]. Hence, early diagnosis of the obstruction and treatment providing relief of the obstruction by using either ureteral stents or PCNs is crucial to preserve kidney function [11].

LIMITATION

There are few limitation of the present study as it is a retrospective study, data may be missed. As it a study from a single centre, it may not be generalised. However, it is first study in our centre to describe profile and management of obstructive uropathy which can contribute for better management of such cases in future.

CONCLUSION

It can be concluded that obstructive uropathy is frequently associated with nephropathy. Blood clots, urolithiasis, malignancies are frequent causes. Prompt relief of block is needed for renal recovery even in chronic cases, though prognosis depends on associated comorbidities.

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