



## Original Research

# Study of Proximal Drainage in the Management of Obstruction in the Urinary Tract

Authors

**Dilip Kothari<sup>1</sup>, Archana Kothari<sup>2</sup>**

<sup>1</sup>Assistant Professor, Department of General Surgery, Index Medical College Hospital & Research Centre, Index City, Nemawar Road, NH-59A, Indore, Madhya Pradesh 452016, India

<sup>2</sup>Assistant Professor, Department of General Surgery, Amaltas Institute of Medical Sciences, Village Bangar, Dewas - Ujjain Highway, District Dewas, Madhya Pradesh 455001, India

Corresponding Author

**Dr Archana Kothari**

Assistant Professor, Department of General Surgery, Amaltas Institute of Medical Sciences, Village Bangar, Dewas - Ujjain Highway, District Dewas, Madhya Pradesh 455001, India

Ph: +91- 9980409739 (M), Email: [drakothari2017@gmail.com](mailto:drakothari2017@gmail.com)

## ABSTRACT

**Background:** *Obstructive nephropathy is a term describing the damage to the renal parenchyma that results from the obstruction to the flow of urine anywhere along the urinary system. Longterm obstruction causes chronic renal disease. Proximal drainage implies drainage of the urinary tract proximal to the site of obstruction. This may be unilateral or bilateral and may be classified as follows: Renal- nephrostomy, pelvic- pyelostomy, ureteral- ureterostomy, vesical- cystostomy and urethral- urethroscopy. The aim of the present work would be to analyse the cases needed such drainage procedure in six months period in a tertiary care teaching hospital, Indore.*

**Methods:** *Proximal drainage operations done in series of 35 cases were standard nephrostomy, U-tube nephrostomy, percutaneous needle nephrostomy, end cutaneous ureterostomy, T-tube ureterostomy, and suprapubiccystostomy. Seven drainage operations were done for permanent diversion of urine, 22 as preparatory to subsequent corrective or palliative surgery and 8 as adjuvant with corrective surgery. Clinical findings, post-operative complaints and results of investigations were noted and both pre and post-operative findings were compared to assess the ultimate results of the surgical treatment.*

**Results:** *In this series, bladder outlet obstruction comprised of 15 cases (42.85%) and ureteral obstruction comprised of 20 cases (57.14%), of which 1 case was due to carcinoma of the urinary bladder involving the ureteric orifices. Out of 9 cases of nephrostomy, 4 cases (44.44%) showed good result; 4 cases (44.44%) showed fair result and 1 case (11.11%) showed bad result. In 21 cases of T-tube ureterostomy, 15 cases (71.42%) showed good result; 3 cases (14.28%) showed fair result and 3 cases (14.28%) showed bad result. Out of the 6 cases of cutaneous ureterostomy, 4 cases (66.66%) showed good result; 1 cases (16.66%) showed fair result and 1 case (16.66%) showed bad result.*

**Conclusion:** *Proximal drainage helps controlling infection, normalizing blood biochemistry, regression of back pressure changes, in a word improving renal function. Proximal drainage of urine should be done before irreversible damage to the renal parenchyma occurs.*

**Keywords:** *Urinary tract obstruction, Obstructive nephropathy, Proximal drainage, Nephrostomy, Urinary tract infection, Complications, Outcome.*

## INTRODUCTION

Obstructive nephropathy is a term describing the damage to the renal parenchyma that results from the obstruction to the flow of urine anywhere along the urinary system. Long term obstruction causes chronic renal disease. Obstruction coexisting with infection and impaired renal function, when complicated by elevated temperature and leukocytosis that can lead to septic shock, are an absolute indication for urinary diversion such as percutaneous nephrostomy. This particular patient needs emergency diversion. One of the most common indications of nephrostomy placement is ureteric obstruction causing uremia. It is therefore necessary to make the patients fit enough for the designated surgery.<sup>1</sup>

Diagnosis of urinary tract obstruction is based on demonstrating opposite increased resistance to flow along the urinary tract. Such increased resistance causes proximal expansion (obstructive uropathy) and side effects on kidney function (obstructive nephropathy) associated with damage of nephron and parenchymal atrophy (obstructive atrophy).<sup>1</sup> Conventional ways of investigation are well known: simple renal scan, ultrasonography, intravenous urography, computed tomography (CT) scan, and magnetic resonance imaging make the diagnosis of obstruction especially by highlighting the consequences of anatomic obstruction, such as pelvocaliceal system expansion and the proximal ureter obstructive lesion.

Urinary tract obstruction occurs most commonly in the young and the old<sup>2</sup>:

- In older men, this is a relatively common condition due to prostatic enlargement:
- Incidence of lower urinary tract symptoms (LUTs)/BPH averages 15 per 1,000 man-years.
- In the age range 45-49, it is 3 per 1,000 man-years but increases to 38 per 1,000 man years by age 75-79.

Acute urinary retention (AUR) is a relatively uncommon sequela, with a cumulative incidence of 2% over almost five years in men with symptomatic BPH.<sup>3</sup> Hydronephrosis due to a

congenital abnormality is relatively common: Prenatally, 1 in 100 fetuses are found to have hydronephrosis on ultrasound - most resolve. An analysis of children presenting incidentally after renal tract trauma found an incidence of congenital renal tract abnormalities of 8.3% - most commonly, PUJ obstruction.<sup>4,5</sup>

Obstruction of the flow of urine occurs when there is obstruction at the neck of the calyces and in the conduits (ureters and urethra) i.e. from the pelvi-ureteric junction to the ureteric orifices and from the internal urethral meatus to the external urethral meatus.<sup>1</sup> Obstruction to the free flow of urine for longer period in any portion of the urinary tract results in a series of events that may eventually result in destruction of the portions of the urinary tract above the site. Obstruction in the ureter of long duration causes hydronephrosis and hydronephrosis in the same side. Urinary tract infection is another major problem in urinary tract obstruction.<sup>6</sup>

Interference with the flow of urine meatus is the most common cause of infection.<sup>6,7,8</sup> Urinary tract obstruction may occur due to various causes at various levels e.g. pelviureteric obstruction due to congenital stricture, stone or blood vessels; ureteral obstruction- due to stone, stricture, ureterocele, carcinoma bladder near the ureteric orifice; bladder outlet obstruction due to bladder neck contracture, posterior urethral valve, prostatic enlargement; urethral obstruction due to stricture urethra, pin hole external meatus etc.<sup>9, 10, 11, 12</sup>

Percutaneous nephrostomy involving suprapubic drainage is one of the most common procedures in urologic practice. Goodwin described a trocar nephrostomy technique in a markedly dilated kidney in 1955 (Goodwin et al., 1955).<sup>13</sup> Percutaneous nephrostomy is performed for temporary or permanent suprapubic urinary diversion. The treatment goals in patients with malignant ureteric obstruction are symptom relief and avoidance of any complications from renal insufficiency. Permanent nephrostomy has been used in patients with obstruction from uncorrectable causes such as inoperable tumors.<sup>13</sup>

Proximal drainage implies drainage of the urinary tract proximal to the site of obstruction. This may be unilateral or bilateral and may be classified as follows: Renal- nephrostomy, pelvic- pyelostomy, ureteral- ureterostomy, vesical- cystostomy and urethral- urethroscopy.<sup>14</sup>

The indication of nephrostomy tube placement depends on whether the procedure is elective or urgent. The purpose of nephrostomy tube placement in obstructive renal disease is to preserve kidney function and drain infected urine. Establishing a safe and reliable nephrostomy tract is key that range from simple urinary drainage to intrarenal surgical operation (Fig. 1-3).

The choice of operation depends on many factors, like the site of obstruction, cause of obstruction, duration of obstruction, condition of the patient, condition of the urinary system, etc. proximal drainage operation may be done for<sup>[14, 15, 16]</sup>:

1. Temporary drainage of urine to prevent further prior to corrective surgery or along with reconstructive surgery of the urinary tract.
2. For permanent diversion of urine where corrective surgery cannot be done.
3. Complications of obstruction as sepsis and pain.
4. Improve renal function.
5. Localized disease that additional therapy may prolong survival.
6. Improve quality of life.
7. Independent existence at home possible.

The aim of the present work would be to analyse the cases needed such drainage procedure in six months period in a tertiary care teaching hospital, Indore. Their indications, effect on the general well-being of the patient and anatomical and physiological improvement of the urinary system will be studied. The effect of drainage operations on subsequent corrective surgery, when they were done as preparatory procedure, will also be studied. This work also includes the assessment of different methods of drainage operation with a view to determine their efficacy and therapeutic applicability.

## MATERIALS AND METHODS

The present prospective observational study was conducted after taking institutional ethics committee permission including the patients (pre and post-operative assessment of cases of urinary tract obstruction undergone proximal drainage operation) who fulfill inclusion and exclusion criteria and given informed written consent. Total number of patients being 35 of which 12 cases had undergone nephrostomy, 8 cases cutaneous ureterostomy, 18 cases "T" tube ureterostomy and 3 cases suprapubic cystostomy. A number of the patients underwent multiple operations. However, the cases of suprapubic cystostomy, except 3 cases of particular interest, were not taken into consideration.

Proximal drainage operations done in our series of 35 cases were standard nephrostomy, U-tube nephrostomy, percutaneous needle nephrostomy, end cutaneous ureterostomy, T-tube ureterostomy, and suprapubic cystostomy. In 4 cases the drainage operations were done as emergency and lifesaving procedure. Seven drainage operations were done for permanent diversion of urine, 22 as preparatory to subsequent corrective or palliative surgery and 8 as adjuvant with corrective surgery. Clinical findings, post-operative complaints and results of investigations were noted and both pre and post-operative findings were compared to assess the ultimate results of the surgical treatment.

The patients were examined for palpable kidney and bladder. Tenderness over the renal area and hypogastric area were noted. Examination of external genitalia was done in every case. Rectal examination was carried out in male cases to detect prostatic pathology. Hb, TLC, DLC, routine urine examination, urine culture, serum urea, creatinine and electrolytes were done before and after operation. X-ray of abdomen and chest was also done. Intravenous pyelography was done. Cystoscopy, retrograde pyelography, radio-contrast studies (using I<sup>131</sup>Hippuran) and renal scan were done in selected cases.

### Surgical procedures:

Patients had undergone one or more the following procedure after their admission in hospital based on requirement. Follow the preparation of skin: under the ultrasonic or fluoroscopic imaging, once the pelvocalical system is clearly visible, the skin is anesthetized with one percent xylocaine or 0.25 percent bupivacaine. Xylocaine is injected into the skin, subcutaneous tissue, muscle, perinephric space and renal capsule with a small cutaneous incision. Using a needle 2 system, a 18-gauge needle is introduced toward the desired site in the renal pelvis at the more lateral point which is usually along the posterior axillary line. This can be followed and monitored by real-time ultrasound or fluoroscopy. Under fluoroscopic guidance, visualization of desired calyx is demonstrated by injection of air and contrast media. In prone position, air usually floats up to posterior calices that it is the marker for the puncture.

For Nephrostomy kidney was approached through oblique lumbotomy incision. For U-tube nephrostomy kidney was exposed in the same way and mobilized. Needle nephrostomy was done only in palpable hydronephrotic kidney. General anesthesia was given and patient being in supine position, the enlarged cystic kidney was palpated and a site of puncture was selected in the flank. In Ureterostomy the ureter was exposed through flank muscle cutting incision. Before the incision was made the site of the ureterostomy stoma was selected and marked. The site was one inch above and medial to the antero-superior spine and moved upward laterally according to the necessity. For T-tube ureterostomy the ureter was exposed in the same way. Ureter was freed from overlying peritoneum, the kinks and angles were straightened. The horizontal limb of a T-tube was introduced, through a rent made previously in between two stay sutures, in the ureter. Interrupted fine catgut stitches were applied to close the rent around the tube. The tube was taken out through a separate stab wound. For suprapubiccystostomy a longitudinal suprapubic midline incision was

made and carried through the subcutaneous tissue to expose the anterior rectus sheath.

Nephrostomy can be performed either by open operation or by closed percutaneous methods. With the development of endourologic and imaging techniques, percutaneous nephrostomy is widely used. Recently, the percutaneous nephrostomy placement became the standard of care, replacing surgical nephrostomy. (Banner et al., 1991 & Sherman et al., 1985) Establishing safe and reliable nephrostomy tract is very important. The aim of the nephrostomy tract ranges from simple urinary drainage to intrarenal surgical operation. For percutaneous renal surgeries, some surgeons prefer a two stage surgery which can limit bleeding, provide a clear field and let the nephrostomy tract mature.<sup>14, 17</sup> A successful outcome without complications is the goal of this procedure, which requires careful preoperative planning and proper techniques. The preoperative anatomy of the patient, the nature of the urologic procedure planned and available equipment are very important.



**Figure 1:** Percutaneous nephrostomy or proximal drainage in patient with complete distal ureteral obstruction.



**Figure 2:** Basic instruments for percutaneous nephrostomy tube placement.



**Figure 3:** Nephrostomy catheter inserted through the guide wire

**RESULTS**

In the present study, out of a total number of 35 cases of urinary tract obstruction, who underwent proximal drainage operation in any form were studied. The cases of obstruction without proximal drainage have been left out of the present study. All the cases of suprapubiccystostomy, except three of particular interest, and the cases of urethral catheter drainage were excluded from the present study.

**Table 1:** Incidence of age in urinary tract obstruction (n=35)

Age group (Yrs)	Number of cases	Percentage
0-10	8	22.86
11-20	4	11.43
21-30	6	17.14
31-40	4	11.43
41-50	3	8.57
51- above	10	28.57
Total	35	

In this series, there were 28 (80%) male and 7 (20%) female patients, the male and female ratio being 4:1 approximately majority of the patients of this series were in the age group of 0-10 years, 21-30 years and 51 and above.

**Table 2:** Incidence of causes of urinary tract obstruction (n=35)

Causes	Number of cases	percentage
Posterior urethral valve	5	14.29
Bladder neck obstruction	6	17.14
Carcinoma of the urinary bladder	1	2.86
Stone in the ureter or pelvis of the ureter	6	17.14
Stone with stricture ureter	4	11.43
Stricture ureter alone	5	14.29
Oedema at the stoma of ureteroneocystostomy	4	11.43
Enlarged prostate	4	11.43

In this series, bladder outlet obstruction comprised of 15 cases (42.85%) and ureteral obstruction comprised of 20 cases (57.14%), of which 1 case was due to carcinoma of the urinary bladder involving the ureteric orifices (Table 2). Out of 20 cases of ureteral obstruction, 7 (35 %) bilateral and 13 cases (65%) unilateral.

**Table 3:** Incidence of different proximal drainage operation (n=35)

Name of the operation	Number of cases undergone
Nephrostomy	12
Cutaneous ureterostomy	8
T-tube ureterostomy	18
Suprapubiccystostomy	3

The total number of drainage operation has exceeded the total number of patients of the present series because in few cases patients underwent multiple drainage operations according to requirement (Table 3).

**Table 4:** Showing the different types of nephrostomy (n=12)

Type of nephrostomy	Number of cases	Percentage
Standard nephrostomy	8	66.7
U-tube nephrostomy	1	8.3
Needle (drip-cath) nephrostomy	3	25

Out of the 12 cases of nephrostomy, in only one case it was done for permanent diversion of urine

because the patient had a solitary kidney with bad upper ureteral stricture. In the rest 11 cases of nephrostomy was done for temporary diversion of urine (Table 4). Cutaneous ureterostomy was done in 8 cases, out of which 3 cases undergone through bilateral cutaneous ureterostomy. In all the 6 cases end cutaneous ureterostomy was done. In the 3 cases this operation was done after T-tube ureterostomy. Out of the 18 cases of T-tube ureterostomy, in 7 cases it was unilateral and in 13 cases bilateral. Of the bilateral cases, in 10 cases the operation was done in the same sitting.

**Table 5:** Showing the incidence of urinary tract infection in the present study

	Number of cases
Infection present before drainage operation	22
Infection occurred after drainage operation	7
Infection persisted shortly after drainage operation	12
Infection persisted long after drainage operation and proper medication	5

**Table 6:** Showing the result of culture of urine (n=35)

Growth of bacteria	Number of cases	Percentage
No growth	9	25.71
E. coli	12	34.28
Streptococcus faecalis	3	8.57
E. Coli & Streptococcus faecalis	3	8.57
Ps. aeruginosa	3	8.57
Streptococcus faecalis & Ps. aeruginosa	1	2.86
Klebsiellae	4	11.43

Excretory pyelography was done in 29 cases in the present study before operation. Excretory pyelography was not done in 6 cases (2 cases came with acute retention of urine, 2 cases with calculus anuria and the other 2 with pyonephrosis). The results of excretory pyelograms are tabulated below (Table 7)

**Table 7:** Showing the various excretory pyelographic findings in the study subjects (n=29)

Pyelographic appearance	Number of cases	Percentage
Bilateral hydroureteronephrosis	8	27.59
Unilateral hydroureteronephrosis	3	10.34
Bilateral hydronephrosis	1	3.44
Unilateral hydronephrosis	3	10.34
Hydronephrosis on one side & hydroureteronephrosis on other side	3	10.34
Bilateral nonfunctioning kidneys	3	10.34
One kidney hydronephrotic & the other non-functioning	4	13.79
One kidney hydroureteronephrotic & the other non-functioning	4	13.79

Out of 8 (27.59%) cases of bilateral hydroureteronephrosis, 7 cases had bladder outlet obstruction, 1 patient had urinary tuberculosis with ureteric strictures and another had carcinoma of the urinary bladder (Table 7). Postoperative excretory pyelograms were done in 21 cases. Out of the rest 14 cases whose pyelography was not done, 4 expired and rest 10 either did not turn up for pyelography. Out of 21 cases, whose excretory pyelography was done, 2 cases are not considered in the table 8 below as each of them had their one kidney removed after nephrostomy. The functional changes that occurred after operation are tabulated below (Table 8).

**Table 8:** Showing improvement or deterioration of function according to excretory pyelography, after operation (n=19)

Functioning of kidneys	Number of cases	Percentage
Improved	17	89.47
Not improved	2	10.53
Deteriorated	1	5.26

Radio isotopic studies were done in 7 preoperative cases and 10 postoperative cases. The 7 preoperative cases, all of them showed obstructive features. Out of 10 postoperative cases, 8 cases and left kidney of the case no. 29 showed good build up and normal clearance. The right kidney of the case no. 29 showed grossly impaired function.

**Table 9:** Showing the parameters for computing results

	Results		
	Good	Fair	Bad
Clinical	Improved	Improved	Deteriorated
Biochemical abnormality	Improved	Improved/Static	Deteriorated
Infection	Controlled	Controlled/ Recurrent	Not controlled
Radiological	Improved	Improved/Static	Deteriorated
Isotopic study	Improved	Improved/Static	Deteriorated
Complications of drainage operation	Nil/ Negligible	Minor	Major
Subsequent surgery performed	Corrective/ Palliative	Palliative	

Bad result was considered when clinically there was no improvement, or there was deterioration of biochemical parameters, infection was not controlled or radiology and radio isotopic study showed deterioration of function or when major complications of drainage operation developed.

**Table 10:** Showing the results of different drainage operations (in percentage)

Type of drainage operation	Results		
	Good	Fair	Bad
Nephrostomy (n=9)	44.44%	44.44%	11.11%
T-tube ureterostomy(n= 21)	71.42%	14.28%	14.28%
Cutaneous ureterostomy (n= 6)	66.66%	16.66%	16.66%
Suprapubiccystostomy (n= 3)	33.33%	66.66%	

Out of 9 cases of nephrostomy, 4 cases (44.44%) showed good result; 4 cases (44.44%) showed fair result and 1 case (11.11%) showed bad result. In 21 cases of T-tube ureterostomy, 15 cases (71.42%) showed good result; 3 cases (14.28%) showed fair result and 3 cases (14.28%) showed bad result (Table 10). Out of the 6 cases of cutaneous ureterostomy, 4 cases (66.66%) showed good result; 1 cases (16.66%) showed fair result and 1 case (16.66%) showed bad result (Table 10). The case had bad result (case no. 3) was a case of urinary tuberculosis with ureteric stricture at the lower third with hydroureteronephrosis and poorly functioning kidney on the other side. Out of the 3 cases of suprapubiccystostomy, 1 case showed good result and 2 cases showed fair result (Table 10).

**DISCUSSION**

Urinary obstruction is the result of impairment of the urinary flow along the urinary tract. This can have a number of causes. It may occur at any point in the urinary tract from the renal calyces to the external urethral meatus. It can cause<sup>18</sup>:

- Proximal distention of the urinary tract - effects will depend on the exact location and severity of the blockage:
- Obstruction in the urethra causes bladder dilation, secondary hypertrophy and diverticulae formation.
- Obstruction in a ureter causes dilation of the ureter (megaureter) and renal pelvicalyceal system (hydronephrosis).
- Pain, particularly when the urinary obstruction is acute.
- Decreased renal function due to back pressure causing renal tubular atrophy, glomerular hyalinization and fibrosis.
- Increased risk of urinary tract infection (UTI), sepsis and stone formation due to urinary stasis.

Certain points along the urinary tract are more susceptible to obstruction:

- Pelvi-ureteric junction (PUJ)
- Where the ureters cross the pelvic brim, at the level of the iliac vessels
- Vesico-ureteric junction (VUJ)

Obstruction can be unilateral or bilateral:

- Unilateral - the most common causes are calculi and neuromuscular malfunction at the junction of the renal pelvis and ureter
- Bilateral - usually with lesions in the bladder base or retroperitoneal tissues

When the urinary tract proximal to the obstruction is drained, there is remarkable restoration of renal function and regression of hydroureteronephrosis (Kumar et al 1973). Kumar et al., showed in their studies that acute renal failure in patients with obstructive uropathy was due to BPH (38%), neurogenic bladder (19%), obstructive pyelonephritis (15%).<sup>18</sup> Drainage of the upper urinary tract is preferred in the advanced cases of bladder outlet obstruction with upper tract

dilatation, as in these cases actually the obstruction, as in these cases actually the obstruction becomes supravescical due to dilatation, tortuosity, kinking and lack of peristalsis of the ureters and also sometimes due to bladder wall hypertrophy which produces intramural ureteral obstruction.<sup>19</sup>

All the drainage operations have got its advantage and disadvantages. With the idea to obviate the advantages there are various modifications of the renal, ureteral, vesical and urethral drainage operations. Multiplicity and the various modifications of these operations points up the problems connected with the drainage operations. Nephrostomy drainage, although used with decreasing frequency, continues to have a place in achieving temporary or permanent drainage of urine in urinary tract obstruction. Operations on the ureteropelvic juncture for hydronephrosis often require temporary nephrostomy drainage.<sup>13</sup> This operation may be necessary preliminary to reconstructive surgery or ileal replacement of ureter.<sup>20</sup> A percutaneous nephrostomy tract can serve both to decompress the renal pelvis and as a route for dissolving renal stones and assisting in basket retrieval of ureteral stones. These techniques are especially valuable in patients who are poor operative risks.<sup>21</sup>

Cutaneous ureterostomy (CU) is a simple, rapid procedure that is easily combined with other procedures. It is preferred for emergency diversion, for poor risk patients and for those with short life expectancy. The main indication for loop CU (LCU) was obstructive uropathy unresponsive to lower urinary tract drainage, and the most common cause was posterior urethral valves. Other indications for LCU included obstruction requiring delayed surgical correction, high-grade reflux into a solitary kidney, and obstruction with infection. LCU is easy to perform and is an excellent method for achieving temporary upper urinary tract drainage. End CU (ECU) is suited for long-term or permanent urinary diversion in children with at least one dilated ureter, and can provide a socially

acceptable stoma when delayed reconstruction is necessary.<sup>[22, 23, 24]</sup>

Workers in urology viz Ellis et al (1966)<sup>19</sup>, Williams and Rabinovitch (1967)<sup>25</sup>, and Perlmutter and Tank (1968)<sup>26</sup> etc. are of the opinion that adequate drainage of the urinary tract proximal to the obstruction should gain priority over actual corrective surgery in the advanced cases of bladder outlet obstruction due to various causes, with upper tract dilatation and impaired renal function.<sup>27</sup>

Complications following simple nephrostomy tube drainage are minor with a rate approaching 4% (LeRoy, 1996).<sup>20</sup> The common complications are hemorrhage, infection, improper catheter placement, nephrostomy tube dislodging after initial proper placement, nephrocutaneous fistula, stone formation and post-obstructive diuresis. Initial hematuria is common, but should be cleared in 24 – 48 hours post operatively.<sup>20, 27</sup>

Small subcapsular hematoma is found about 3% of cases, a complication that is usually resolved without sequelae. Bleeding from iatrogenic arteriovenous-caliceal fistulas occurs in less than 2% and can be managed with angio-embolization. Nephrostomy tube dislodgement from the skin can be undertaken even when carefully fixed to the skin with silk suture. Zhou and colleges reported a new technique to reinforce the nephrostomy tube in 48 patients by using 2 cm long rubber drainage tube as the outer tube to encase the nephrostomy tube and suturing the longitudinal cutting edges together with the skin suture. This technique can significantly decrease the dislodgement incidence of nephrostomy tube (Zhou et al., 2011).<sup>28, 29</sup>

Prevention of nephrocutaneous fistula, a nephrostogram should show radio-opaque contrast medium passing freely down the ureter into the bladder. Clamping the catheter should be done before removing the catheter and should cause no pain and no leakage around the catheter.<sup>29</sup>

## CONCLUSION

It was observed that incidence of urinary tract obstruction is fairly common. However, not all of them require proximal drainage. Urinary tract



infection was found in most of the cases, commonest offender being E. coli. Blood biochemical abnormality in the values of urea, creatinine or electrolytes is also quite common, and more so in the cases of the solitary kidney, or affection of one kidney and the other was diseased previously. Back pressure changes in the form of dilatation was present. Radiological study was found highly valuable in detecting the anatomical changes. Radio isotopic study was also found helpful in detecting the state of renal function.

Drainage operation was done as preparatory to subsequent corrective or palliative surgery in majority of the cases. After drainage, in most of the cases there was control of infection. Normalization of blood biochemistry and regression of back pressure changes, and all of which improved the outlook of the subsequent surgery (where required). Proximal drainage helps controlling infection, normalizing blood biochemistry, regression of back pressure changes, in a word improving renal function. Proximal drainage of urine should be done before irreversible damage to the renal parenchyma occurs.

**Funding:** No funding sources

**Conflict of interest:** None declared

## REFERENCES

1. Thurnher S, Tzika AA, Hricak H, Mattei P, Aboseif S, Engelstad B, et al. Noncontrast and contrast enhanced MR imaging in the evaluation of partial ureteral obstruction: an experimental study in the micropig, *Invest Radiol* 1989;24(7):544-554.
2. Naderi N, Mochtar CA, de la Rosette JJ. Real life practice in the management of benign prostatic hyperplasia. *Curr Opin Urol*. 2004 Jan; 14(1):41-4.
3. Fitzpatrick JM. The natural history of benign prostatic hyperplasia. *BJU Int*. 2006 Apr; 97 Suppl 2:3-6.
4. McAleer IM, Kaplan GW, LoSasso BE. Congenital urinary tract anomalies in pediatric renal trauma patients. *J Urol*. 2002 Oct; 168(4 Pt 2):1808-10.
5. Najjar MS, Saldanha CL, Banday KA. Approach to urinary tract infections. *Indian J Nephrol*. 2009 Oct; 19(4):129-39.
6. Rose JG, Gillenwater JY. Pathophysiology of ureteral obstruction. *Am J Physiol*. 1973 Oct; 225(4):830-7.
7. Heyns CF. Urinary tract infection associated with conditions causing urinary tract obstruction and stasis, excluding urolithiasis and neuropathic bladder. *World J Urol*. 2012 Feb; 30(1):77-83.
8. Roth CC, Hubanks JM, Bright BC, Heinlen JE, Donovan BO, Kropp BP, Frimberger D. Occurrence of urinary tract infection in children with significant upper urinary tract obstruction. *Urology*. 2009 Jan; 73(1):74-8.
9. Becker A, Baum M. Obstructive uropathy. *Early Hum Dev*. 2006 Jan; 82(1):15-22.
10. Chevalier RL. Pathogenesis of renal injury in obstructive uropathy. *Curr Opin Pediatr*. 2006 Apr; 18(2):153-60.
11. Ilbeigi P, Lombardo S, Sadeghi-Nejad H. Unusual cause of obstructive uropathy. *Int Urol Nephrol*. 2005; 37 (3):505-6.
12. Zeidel ML, Pirtskhalaishvili G. Urinary tract obstruction. In: Brenner & Rector's *The Kidney*. 7th ed. 2004.
13. Goodwin WE, Casey WC, Woolf W. Percutaneous trocar (needle) nephrostomy in hydronephrosis. *J Am Med Assoc* 1955; 157(11):891-4.
14. Banner MP, Ramchandani P, Pollack HM. Interventional procedures in the upper urinary tract. *Cardiovasc Intervent Radiol* 1991; 14(5):267-84.
15. Curhan, CG. & Zeidel, ML. (1996). Urinary tract obstruction, In BM Brenner (ed): *The kidney*. 5th ed. Philadelphia, WB Saunders CO, Vol 2 Chap41, 1391.
16. Falahatkar S, Asgari SA, Nasseh H, Allahkhah A, Farshami FJ, Shakiba M, Esmaeili S. Totally ultrasound versus

- fluoroscopically guided complete supine percutaneous nephrolithotripsy: a first report. *J Endourol* 2010; 24(9):1421-6.
17. Sherman JL, Hopper KD, Greene AJ, Johns TT. The retrorenal colon on computed tomography: a normal variant. *J Comput Assist Tomogr* 1985; 9(2):339-41.
  18. Kumar R, Hill CM, McGeown MG. Acute renal failure in the elderly. *Lancet* 1973 Jan 13; 1(7794):90-1.
  19. Ellis DG, Fonkalsrud EW, Smith JP. Congenital posterior urethral valves. *J Urol.* 1966 Apr; 95(4):549-54.
  20. LeRoy, AT. (1996). Percutaneous access, In: Smith, AD. & Badlani, GH. & Bagley, DH. (eds): *Smith's textbook of Endourology*. 1st ed. St Louis, Missouri, Quality Medical Publishing, Inc, Chap 14, P 199-223.
  21. Smith AD, Reinke DB, Miller RP, Lange PH. Percutaneous nephrostomy in the management of ureteral and renal calculi. *Radiology* 1979 Oct; 133(1):49-54.
  22. Boyarsky S, Martinez J. Pathophysiology of the ureter. Partial ligation of the ureter in dogs. *Invest Urol* 1964; 2:173.
  23. Kearney GP, Docimo SG, Doyle CJ, Mahoney EM. Cutaneous ureteros-tomy in adults. *Urology* 1992 Jul; 40(1):1-6.
  24. Rosen MA, Roth DR, Gonzales ET Jr. Current indications for cutaneous ureteros-tomy. *Urology* 1994 Jan; 43(1):92-6.
  25. Williams DI, Rabinovitch HH. Cutaneous ureterostomy for the grossly dilated ureter of childhood. *Br J Urol.* 1967 Dec; 39(6):696-9.
  26. Perlmutter AD, Tank ES. Loop cutaneous ureterostomy in infancy. *J Urol.* 1968 May; 99(5):559-63.
  27. Das SK, Panda A, Gupta TR, Chowdhury A, Kesari GS, Sen S. Role of proximal drainage in obstruction in the urinary tract: an observational study. *Int Surg J* 2017;4:270-7.
  28. Zhou T, Gao X, Yang C, Peng Y, Xiao L, Xu C, et al. Reinforcement for percutaneous nephrostomy tubes with a new technique. *J Endourol* 2011; 25:41-4.
  29. Heyns CF. Urinary tract infection associated with conditions causing urinary tract obstruction and stasis, excluding urolithiasis and neuropathic bladder. *World J Urol* 2012 Feb; 30(1):77-83.