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Role of proximal drainage in obstruction in the urinary tract: an observational study

Subrata Kumar Das¹, Anshuman Panda¹, Tapas Ranjan Gupta¹, Arunava Chowdhury⁴, Gouri Shankar Kesari², Sukanta Sen³*

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*Correspondence: Dr. Sukanta Sen,

E-mail: drsukant@gmail.com

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ABSTRACT

Background: Urinary tract obstruction may occur due to various causes at various levels. 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- urethrostomy. 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, Kolkata, India.

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 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.

Results: 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. 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 suprapubic cystostomy, 1 case showed good result and 2 cases showed fair result.

Conclusions: Drainage operation was done as preparatory to subsequent corrective or palliative surgery in majority of the cases. 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: Complications, Outcome, Proximal drainage, Urinary tract obstruction, Urinary tract infection

INTRODUCTION

Evacuation of urine is essential to maintain the normality of life. This process may be impaired due to obstruction

in any form in the urinary tract, which causes reduction of flow through the site of obstruction. 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.

¹Department of General Surgery, ²Department of General Medicine, ³Department of Pharmacology, ICARE Institute of Medical Sciences and Research, Haldia, West Bengal, India

⁴Department of General Surgery, Institute of Post Graduate Medical Education and Research, Kolkata, West Bengal, India

from the pelvi-ureteric junction to the ureteric orifices and from the internal urethral meatus to the external urethral meatus. 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 hydroureter and hydronephrosis in the same side. Urinary tract infection is another major problem in urinary tract obstruction.

Interference with the flow of urine meatus is the most common cause of infection. 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. 4-7

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- urethrostomy.⁸

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:

- Temporary drainage of urine to prevent further prior to corrective surgery or along with reconstructive surgery of the urinary tract
- For permanent diversion of urine where corrective surgery cannot be done.

The aim of the present work was to analyse the cases needed such drainage procedure in six months period in a tertiary care teaching hospital, Kolkata, India. 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.

METHODS

The present 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 11 cases had undergone nephrostomy, 6 cases cutaenous ureterostomy, 20 cases "T' tube ureterostomy and 3 cases suprapubic systostomy. 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 I131 Hippuran) and renal scan were done in selected cases.

Operative procedures

Patients had undergone one or more the following procedure after their admission in hospital based on requirement.

Nephrostomy

The kidney was approached through oblique lumbotomy incision.

U-tube nephrostomy

The kidney was exposed in the same way and mobilized.

Needle nephrostomy

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.

Ureterostomy

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 anterio-superior spine and moved upward laterally according to the necessity.

T-tube ureterostomy

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.

Suprapubic cystostomy

A longitudinal suprapubic midline incision was made and carried through the subcutaneous tissue to expose the anterior rectus sheath.

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 suprapubic cystostomy, 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 (years)	Number of cases	Percentage
0-10	8	22.86
11-20	3	8.57
21-30	7	20
31-40	4	11.43
41-50	2	5.71
51- above	11	31.43
Total	35	

In this series, there were 27 (77.14%) male and 8 (22.86%) female patients, the male and female ratio being 3:1 approximately majority of the patients of this series were in the age group of 0-10 years, 21-30 years and 51 and above.

In this series, bladder outlet obstruction comprised of 15 cases (42.85%) and ureteral obstruction comprised of 20 cases (57.14%), of which 2 cases were due to carcinoma of the urinary bladder involving the ureteric orifices (Table 2). Out of 20 cases of ureteral obstruction, 8 (40%) bilateral and 12 cases (60%) unilateral.

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

Causes	Number of cases	Percentage
Posterior urethral valve	4	11.43
Bladder neck obstruction	7	20
Carcinoma of the urinary bladder	2	5.71
Stone in the ureter or pelvis of the ureter	5	14.29
Stone with stricture ureter	4	11.43
Stricture ureter alone	8	22.86
Oedema at the stoma of uretero neocystostomy	1	2.86
Enlarged prostate	4	11.43

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

Name of the operation	Number of cases undergone
Neprostomy	11
Cutaneous ureterostomy	6
T-tube ureterostomy	20
Suprapubic cystostomy	3

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

Table 4: The different types of nephrostomy (n = 11).

Type of nephrostomy	Number of cases	Percentage
Standard nephrostomy	9	81.81
U-tube nephrostomy	1	9.09
Needle (drip-cath) nephrostomy	1	9.09

Out of the 11 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 10 cases of nephrostomy was done for temporary diversion of urine (Table 4). Cutaneous ureterostomy was done in 6 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 20 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.

Serum bicarbonate and chloride level were estimated only in 4 postoperative cases and in all of them there was fall of serum bicarbonate level and rise in serum chloride level. Serum calcium and phosphate (inorganic) were estimated in almost all the preoperative cases of urinary calculi and were found within normal limits. In all the 35 cases blood urea was estimated before and after operation. In one patient which blood urea was above 40 mg% went to 24 mg% after drainage operation. In almost all the patients showed rise of blood urea level early after drainage operation but it was more pronounced in the cases who had high blood urea level before operation. Serum creatinine was noted high (above 1.5mg%) in 16 cases before operation, but before discharge their number was only 2.

Table 5: Incidence of urinary tract infection in the present study.

Urinary tract infection	Number of cases
Infection present before drainage operation	25
Infection occurred after drainage operation	6
Infection persisted shortly after drainage operation	14
Infection persisted long after drainage operation and proper medication	5

Table 6: Result of culture of urine (n = 35).

Growth of bacteria	Number of cases	Percentage
No growth	8	22.86
E. coli	13	37.14
Streptococcus faecalis	3	8.57
E. Coli and Streptococcus faecalis	2	5.71
P. aerugenosa	4	11.43
Streptococcus faecalis and P. aerugenosa	1	2.86
Klebsiellae	4	11.43

Serum potassium level was estimated in 11 cases only. Preoperatively 9 (81.8%) patients had serum potassium level above 5.5 mEq/litre. After drainage operation only 4 patients (36.3%) had their serum potassium level above 5.5 mEq/litre. Three of them expired during their stay in the hospital. Serum potassium level was estimated in 11 cases only. The serum sodium level in 5 preoperative patients were below 130 mEq/litre, after drainage of urinary tract obstruction 3 patients had below 130 mEq/litre and all of them expired during their stay in the hospital.

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: Various excretory pyelographic findings in the study subjects (n = 29).

Pyelographic appearance	Number of cases	Percentage
Bilateral hydroureteronephrosis	9	31.03
Unilateral hydroureteronephrosis	2	6.89
Bilateral hydronephrosis	1	3.44
Unilateral hydronephrosis	3	10.34
Hydronephrosis on one side and hydroureteronephrosis on other side	3	10.34
Bilateral nonfunctioning kidneys	3	10.34
One kidney hydronephrotic and the other non-functioning	4	13.79
One kidney hydroureteronephrotic and the other non-functioning	4	13.79

Out of 9 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 were 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: 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

Out of the 29 cases who had excretory pyelogram and cystogram done, 11 had no abnormality in the bladder and in 1 case bladder was not visualized with dye. The abnormalities that were seen are tabulated below (Table 9).

Table 9: Various vesical abnormalities that were seen in 17 cystograms (n = 17).

Vesical abnormalities	Number of cases	Percentage
Large capacity	12	70.59
Small capacity	3	17.65
Irregular shape	4	23.53
Thick wall	2	11.76
Diverticular	1	5.88
Residual urine	11	64.70
Filling defect	2	11.76

The 12 cases had large capacity bladder and all of them had bladder outlet obstruction. Three cases had bladder with small capacity and all of them had urinary tuberculosis. The 2 cases of thick walled bladder also had urinary tuberculosis. 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 10: The incidence of leakage in days after removal of T-tube in the study (n = 15).

Leakage of urine in days	Number of cases	Percentage
No leakage	5	33.33
1 day	5	33.33
2 days	1	6.66
3 days	3	20
4 days	1	6.66

Table 11: Incidence of leakage in days after removal of nephrostomy tube in the study (n = 7).

Leakage of urine in days	Number of cases	Percentage
No leakage	2	28.57
1 day	1	14.28
2 days	1	14.28
8 days	1	14.28
10 days	1	14.28
More than 15 days	1	14.28

Table 12: 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	

Table 13: 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%
Suprapubic cystostomy (n = 3)	33.33%	66.66%	

In the 20 cases of T-tube ureterostomy, in 3 cases T-tube ureterostomy was converted into cutaneous ureterostomy, and 2 cases of T-tube ureterostomy expired. The incidence of leakage of urine in days after removal of the tube is shown in the table below (Table 10).

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.

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 13). 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 13). 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 suprapubic cystostomy, 1 case showed good result and 2 cases showed fair result (Table 13).

DISCUSSION

When the urinary tract proximal to the obstruction is drained, there is remarkable restoration of renal function and regression of hydroureteronephrosis Kumar et al. 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%). 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 supravesical 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. To

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. ¹¹ This operation may be necessary preliminary to reconstructive surgery or ileal replacement of ureter. ¹²

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. ¹³

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.¹⁴⁻¹⁶

Workers in urology viz Ellis et al, Williams and Rabinovitch and Perlmutter and Tank 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. ^{10,17,18}

Two thirds of all the cases of ureteral calculus occur between the ages of 20 and 50 years Winsbury White HP. 19,20 However, children and old people are not immune. In most published series the condition is more common in males than in females. They can be caused by a low fluid in intake, hot environment causing dehydration, high salt and protein intake are other possible factors along with metabolic abnormalities in the blood or urine such as a high calcium oxalate, uric acid or cysteine levels.²¹ Dietary risk factors for stone disease were shown different by age and sex. In particular in younger women dietary calcium, phytate and fluid intake were associated with a reduced risk of stone formation whereas animal protein and sucrose increased the risk of stone incidence. In older adults there was no association between dietary calcium and stone formation whereas magnesium, potassium and fluid intakes decreased and total vitamin C intake increased the risk of symptomatic nephrolithiasis. 21,22 In our series there were 9 cases of urinary calculi and 8 of them (88.8%) were between the ages of 20 and 50 years and 5 of them (55.5%) were male. In 4 cases of urinary calculi there was associated ureteric stricture. In all these 4 cases infection was present. Stricture formation takes place more frequently in the presence of infection (Straffon and Higgins).

Eight cases in our series had ureteric stricture alone. Five of them had tuberculous stricture and all of them were receiving antitubercular drugs (ATDs). Under the influence of ATDs stricture and obstruction occur more rapidly due to healing action of the drug.²⁴

Interference with the flow of urine from the kidney to the urethral meatus is the most common cause of urinary infection in the present study urinary infection was fairly common (71.42%) at the time of presentation.²⁵ It is very difficult to bring under control with suitable medication alone. Free drainage of urine is mandatory along with suitable urinary antiseptic to control the infection quickly and effectively. Hinman et al. showed that residual urine affects the antibacterial therapy by reducing optimum concentration of the drug, decreasing the rate of elimination, and thus increasing the chance of mutation.²⁶

Carrol et al in a series of 1,000 cases of urinary tract infection found E.coli to be the commonest offender and they were found in 24.5% cases ans pseudomonas aerogenusa was found to be the next (15.9%).²⁵ E. coli

was found to be the commonest offender in the present study (50%). Impairment of renal function may occur in conditions in which there is obstruction to the urinary tract. Uraemia resulting from this called post renal uraemia. This is reflected in the blood by biochemical disturbances. Blood biochemical disturbances occur in advance cases of urinary obstruction due to renal damage. Similar observations had been noticed in the present study. Surgical treatment is required in all cases of post renal obstruction with impaired renal function. Even if the uraemia is severe, the relief of obstruction followed by high fluid intake results in recovery of renal function in many cases. This is indicated by correction of biochemical disturbances.

Temporary nephrostomy drainage after operation on the pelviureteric juncture for hydronephrosis is favored by many. Proper ureteral stenting and pelvic urinary diversion via nephrostomy decreases the post-operative complications Smart.²⁸ In calculus anuria this operation is done as a life-saving procedure. In the present series nephrostomy was done in all 11 cases- bilateral in 1 case and unilateral in 10 cases. In 10 cases nephrostomy was done for temporary drainage of urine.

Drainage of bladder in the form of suprapubic cystostomy is done in obstruction below the bladder. It is usually done as a temporary measure when catheterisation or instrumentation fails in prostatic obstruction and stricture urethra, and occasionally it may have to be done permanently when a major surgical undertaking may endanger patient's life. Suprapubic cystostomy is avoided by most of the urologist whenever possible.

The choice of proximal drainage operation should be one which is simple, least time consuming and causes minimum trauma as most of the cases of urinary obstruction require drainage operation, usually have variable degree of impaired renal function. T-tube ureterstomy is a rapid and simple procedure with minimum trauma. The ureter is drained without disrupting ureteral continuity and which obviates a major disadvantage of other ureteral drainage procedure.²⁹

To minimise bleeding and muscle trauma Goodwin et al advocated percuatenous trocar (needle) nephrostomy for temporary drainage of urine without open operation.³⁰ First described by Goodwin et al as a minimally invasive treatment for urinary obstruction causing marked hydronephrosis, percutaneous nephrostomy (PCN) placement quickly found use in a wide variety of clinical indications in both dilated and nondilated systems.³⁰ Although the advancement of modern endourological techniques has led to a decline in the indications for primary nephrostomy placement, PCNs still play an important role in the treatment of multiple urologic conditions.³¹ There are four broad indications for the placement of a PCN. These are relief of urinary obstruction, diagnostic testing, access for therapeutic interventions and urinary diversion. To determine the

appropriateness of nephrostomy placement, familiarity with the clinical presentation, diagnostic work-up, and typical management of each specific indication is essential.³¹

The parameters for computing result of different drainage operations were-clinical, biochemical, state of infection, radiology and isotope study, complications, fitness to perform subsequent corrective/ palliative surgery. Good result was considered when there was clinical improvement; blood biochemical abnormality was normalized; infection was controlled or did not occur in the cases without preexisting infection; radiologically there was improvement; isotope study showed improvement; complications of the drainage study was nil or negligible and subsequent corrective surgery could be done when required.

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).

T-tube ureterostomy was found very simple and effective procedure, and with reasonably low complication rate. Cutaneous ureterostomy was found useful for long term or permanent diversion of urine. Nephrostomy was found to be the only choice in the cases with pelviureteric obstruction, pyelostomy being a poor procedure.

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.

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institutional ethics committee

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