Ureterostomy in Situ for Ureteral Splinting and Temporary Urine Drainage

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Abstract : Ureterostomy in situ is a simple technique for supravescical urinary diversion. Although it was described about 30 years ago, the method has yet to become popular. We employed mainly this method as ureteral splinting and as temporary urine drainage in 24 patients with ureteropelvic operation, and recommend it as a useful method for technical simplicity and other merits.

Key words : ureteral splint, temporary urine drainage, ureterostomy in situ, pyeloplasty, pyelolithotomy.

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Introduction

There has been great progress in renal pelvic and ureteral surgery in the last twenty years. The predominant way is still calculous obstruction but reparative and plastic surgery of the renal pelvis and the ureter for congenital and acquired lesions are among the most interesting advances in modern urology. These operations are always accompanied by the risk of postoperative urine leakage or urinary obstruction at the anastomosis. Since these complications would not only delay healing of the wound but also lead to a failure of the operation in many cases, the ureteral splint catheter as a supplementary technique is often used in ureteropelvic operations together with insertion of a temporary wound suction drain.

We have also positively used the ureteral splint catheter. There are a variety of techniques available for establishment of the catheter. This paper describes our experiences with ureterostomy in situ which is a rather unpopular technique.

Indications and Analysis

Ureterostomy in situ was carried out on a total of 24 patients who were operated on at the Urology Clinic in the University Hospital of Occupational and Environmental Health between August 1979 and December 1982. They consisted of twenty men and 4 women with ages ranging from 19 to 80 years. Their diagnoses were upper urinary tract calculi in 16 patients, ureteral obstruction in six patients and congenital hydronephrosis and chronic pyelonephritis secondary to renal pelvic foreign body in one patient,

respectively. The operative modes were pyelolithotomy in ten patients, transuretero-ureterostomy in four patients, heminephrectomy in two patients, pyeloplasty in two patients, retropubic prostatectomy in two patients, ureterolithotomy in two patients, and nephro-pyelolithotomy and extirpation of renal pelvic foreign body in one patient, respectively (Table 1).

The operative technique is very simple (Fig. 1). A stab incision was made on the ureteral wall 4 to 5 cm peripherally to the pelvis and ureteral anastomosis, and the catheter was inserted through the incision up to the renal pelvis. The catheter was then fixed with a fine catgut suture on the wall of the ureter at the point of insertion. Four or 5 side holes should be opened 5 cm from the tip of the catheter. The catheter was passed through the retroperitoneal space in a gentle curve along the ureter, and guided outside the body through a stab incision on the flank. The catheter was anchored securely at the exit site on the skin by a silk suture.

The catheters used were a 7.5 F silicone tube in seven patients and a 6 to 8 F vinyl tube in 17 patients. The catheter was inserted at the upper ureter in 18 patients and at the lower ureter in six patients. The catheter to the urinary tract was kept for 7 days after operation at longest in six patients, for 8 to 14 days in 11 patients, for 21 days in three patients and for 22 days more in four patients. The track following removal of the catheter was closed within 3 days in all patients.

As an early complication associated with ureterostomy in situ procedure, temporary urine leakage was noted in nine patients. In three of the nine patients, some of the holes opened 5 cm from the catheter's tip were separated a little from the ureter wall due to insufficient fixation of the catheter on the ureteral wall. The remaining six patients had so severe inflammatory change at the pelvic wall that we were unable to suture tightly enough. While the catheter was retained, seven patients had a fever of over 38°C; five of them had a fever on the 4th day after operation due to obstruction of the catheter caused by blood clots or kinking of the catheter. The remaining two patients had retention of the catheter for longer periods of time, and they had a fever for more than 2 weeks after operation. After removal of the catheter, two other patients suffered from a temporary fever of over 38°C. Fever did not develop in the patients with urinary fistula formed after removal of the catheter. One serious complication was experienced in one patient in whom a silicone tube was used the catheter was torn off at a distance of 11 cm from its tip and remained within the pelvis to the ureter. The tearing-off resulted from involvement of the catheter in suturing of the ureteral wall for spontaneous ureteral perforation. This patient had the intra-pelvic residual catheter removed later by surgical procedures, but pyuria continued until then. After this episode, the soft silicone tube was replaced by the vinyl tube, which successfully prevented such trouble from occurring again.

Drip infusion pyelograms (DIP) were taken 3 months after operation in order to see its influence on the urinary tract following removal of the catheter. No patient showed evidence of contrast medium leaking outside the urinary tract. However, kinking and

Table 1. Summary of 24 patients with ureteral splinting by ureterostomy in situ procedure

Patient	Age (yr) Sex	Diagnosis	Operation	Splinting catheter	Days of indwelling catheter
M. T.	24 M	Rt renal calculi	Extended pyelolithotomy	Silicone tube 7.5 F	7
I. O.	34 M	Rt renal calculus	Extended pyelolithotomy	Silicone tube 7.5 F	7
M. N.	80 M	Benign prostatic hypertrophy with lt hydronephroureter	Retropubic prostatectomy	Silicone tube 7.5 F	11
T. I.	30 M	Rt renal calculi	Extended pyelolithotomy	Silicone tube 7.5 F	11
T. I.	62 M	Urine leakage after partial cystectomy and ureteroneocystostomy for bladder cancer	Transureteroureterostomy	Silicone tube 7.5 F	8
Y. T.	75 M	Urine leakage after partial cystectomy and transureteroureterostomy for bladder cancer	Reconstruction of transureteroureterostomy	Silicone tube 7.5 F	9
T. I.	64 M	Bilateral renal calculi spontan rupture of lt renal pelvis	Lt extended pyelolithotomy	Silicone tube 7.5 F	9
T. I.	65 M	Lt chronic pyelonephritis secondary with renal pelvic foreign body catheter	Extirpation of lt renal pelvic foreign body	Vinyl tube 7 F	26
K. S.	59 F	Rt staghorn calculus	Extended pyelolithotomy	Vinyl tube 8 F	7
H. W.	53 F	Lt renal calculi	Nephro-pyelolithotomy	Vinyl tube 8 F	4
T. Y.	51 M	Lt renal calculi	Extended pyelolithotomy	Vinyl tube 8 F	9
T. S.	36 F	Bilateral renal calculi	Lt extended pyelolithotomy	Vinyl tube 8 F	61
Y. K.	19 M	Lt hydronephrosis with aberrant vein	Dismembered pyeloplasty (Anderson-Hynes)	Vinyl tube 6 F	12
Y. F.	50 M	Bilateral renal calculi Rt localized hydronephrosis of the lower pole Rt double pelvis and ureter	Rt heminephrectomy and nephrolithotomy	Vinyl tube 7 F	20
T. M.	49 M	Bilateral renal calculus Lt ureteral calculus	Lt ureterolithotomy	Vinyl tube 7 F	18

(Continued on next page)

Table 1. (Continued).

Patient	Age (yr) Sex	Diagnosis	Operation	Splinting catheter	Days of indwelling catheter
S. F.	57 M	Lt renal calculus with localized hydronephrosis of the lower pole	Heminephrectomy and nephrolithotomy	Vinyl tube 8 F	14
H. M.	71 M	Lt distal ureter stenosis after ureteroneocystostomy for segmental resection of lower ureter tumor	Transureteroureterostomy	Vinyl tube 7 F	5
S. S.	40 M	Rt renal calculi	Extended pyelolithotomy	Vinyl tube 8 F	10
A. M.	49 M	Bladder cancer	Partial cystectomy and transureteroureterostomy	Vinyl tube 8 F	5
K. K.	55 M	Lt ureteral calculus with ureteral stenosis	Ureterolithotomy	Vinyl tube 7 F	27
Y. U.	33 M	Rt renal calculi	Coagulum pyelolithotomy	Vinyl tube 8 F	29
A. I.	53 M	Rt renal calculi and hydronephrosis secondary to accessory renal artery with scar tissue crossing renal pelvis	Nephrolithotomy and pyeloplasty (Y-V procedure)	Vinyl tube 8 F Vinyl tube	13
K. F.	66 M	Benign prostatic hypertrophy and lt hydronephroureter with lower ureteral stricture	Retropubic prostatectomy and lt ureteroureterostomy	Vinyl tube 7 F	17
S. T.	46 M	Rt renal calculus	Extended pyelolithotomy	Vinyl tube 8 F	14

Fig. 1. Ureterostomy in situ procedures.

A: permanent or temporary urinary diversion, B: ureteral splint catheter, C: temporary urine drainage.

mild stricture was visualized at the part of the ureter where the catheter was inserted in one patient. The catheter was guided from the ureteral point of insertion to the wall of the lateral abdomen at too sharp an angle, which raised the ureteral point of insertion like a tent, thus producing the kinking and stricture.

Management of the ureteral splint catheter by ureterostomy in situ: We employed F. 6 to 8 silicone or vinyl tubes. The silicone tube had some disadvantages. Its wall was so soft that the tube was liable to be kinked or obstructed when the patient changed his position, and the lumen was liable to collapse with negative pressure used for washing-out of blood clots. On the other hand, the vinyl tube was free from such defects, but when the maintenance exceeded 14 days, the lumen of the vinyl tube incrustated in salt, and it had to be washed at regular intervals. Therefore, if it is to be retained over a long period of time, special care must be taken.

Case Abstracts

Case 1: K. S., 59-year-old woman. She began to have right lumbar pain in February 1981, followed by development of right acute pyelonephritis in March, and was then admitted to a certain hospital. At that time, she was diagnosed as right wandering kidney with staghorn calculus. Because of persistent right lumbar pain, she was admitted to our clinic on June 1, 1981. On June 9, staghorn calculus was removed through the right extended pyelolithotomy. Because of severe inflammatory change of the pelvic wall, the ureteral splint catheter (vinyl tube of 7 F) by ureterostomy in situ was performed. At the same time, nephropexy was done with drainage within the wound.

Her postoperative course was uneventful, and the splint catheter was removed on the 7th day after operation. DIP taken 3 months after operation revealed mild right hydronephrosis but no evidence of dye extravasation or of kinking and stricture at the ureteral insertion point of the splint catheter (Fig. 2A, 2B).

Case 2: Y. K., 19-year-old male. He first became aware of left flank pain at 17 years of age. The pain was always accompanied by reduction of the urine volume, and he noticed that disappearance of the pain was followed by polyuria for about 2 days. As the left flank pain became more frequent in the summer of 1980, he visited a doctor in his neighborhood, who diagnosed left hydronephrosis by DIP. The patient was then referred to our clinic and admitted on August 4, 1981. Renal angiography established the diagnosis of left hydronephrosis with an aberrant renal vein crossing the ureteropelvic junction. On August 25, 1981, left dismembered pyeloplasty (Anderson-Hynes procedure) was performed. A small incision was made on the ureteral wall 8 cm distally from the ureteropelvic anastomosis, and ureteral splinting by ureterostomy in situ using a 6 F vinyl tube was performed. A drain was instituted within the wound.

The patient made favorable progress after his operation without any evidence of urine

Fig. 2. Case 1. A: preoperative plain abdominal film demonstrates right staghorn calculus, B: postoperative DIP.

Fig. 3. Case 2. A: pyeloureterogram per splint catheter shows a traceable amount of contrast medium extravasation around the ureter, B: postoperative DIP.

Fig. 4. Various forms of urinary drainage.

A: ureteral catheter, B: transvesical ureteral catheter (transvesical ureterostomy in situ), C: ureteral splint catheter, D: nephrostomy, E: ureterostomy in situ, F: cutaneous ureterostomy.

leakage from the drain, and the splint catheter was removed on the 12th day following operation. A retrograde pyeloureterogram taken through the splint catheter before its removal only showed a traceable amount of contrast medium extravasation around the ureter (Fig. 3A). However, removal of the catheter was not followed by either urine leakage from the catheter track or development of fever. DIP taken 3 months after the operation revealed improvement of the left hydronephrosis without leakage of contrast medium outside the ureter or kinking and stricture of the ureter (Fig. 3B).

Discussion

As shown in Fig. 4, there are various ways for indwelling of the splint catheter which is being used in ureteropelvic surgery. Ureterostomy in situ was first introduced by Vose & Dixey (1953), who reported it originally as one method for urinary diversion. In those days, urinary diversion which was then being generally conducted for bilateral ureteral obstruction was nephrostomy or cutaneous ureterostomy. However, nephrostomy was associated with a disadvantage that it was occasionally difficult to reinsert the catheter into the accurate position within the pelvis at the time of replacement of the catheter. Cutaneous ureterostomy was associated with a defect, namely, that stricture was liable to occur at the ureterocutaneous opening as well as at a particular portion of the ureter penetrating through the fascia of the abdominal wall. Ureterostomy in situ was devised as a method free of such demerits. It was originally applied to a dilated ureter. The lower third ureter was exposed extraperitoneally through a Gibson's incision in the lower abdomen. A longitudinal incision was made on the ureteral wall without the ureter dissecting from its position or altering its course, and the balloon catheter (14–18 F) was

pushed up to the renal pelvis, and after being passed through the retroperitoneal cavity in a large and gentle curve, the catheter was guided outside the abdominal wall through a stab incision. They reported that the method permitted a successful reinsertion of the catheter 2 to 6 weeks after operation, and that ureterostomy in situ distinguished it from other types of ureterostomy e.g. cutaneous. That is, they reported it as one permanent urinary diversion with small surgical risk. Subsequently, Byron *et al.* (1961) conducted ureterostomy in situ as one emergency temporary urinary diversion in four patients with preterminal uremia due to lower bilateral ureteral obstruction originating from a benign condition or a resectable cancer, and described it as "a simple, rapid, relatively innocuous procedure that can be done under local anesthesia in a fraction of the time and much more safety than nephrostomy, pyelostomy or ileal conduit". In other words, they introduced ureterostomy in situ as a simple and safe method for establishment of temporary urinary diversion which can be performed to improve general conditions prior to radical operation of bilateral ureteral obstruction. Pokorny *et al.* (1976) also carried out ureterostomy in situ for the same purpose. Also, there is a different report in which ureterostomy in situ was conducted as an emergency treatment for ureteral injury using a T tube as the catheter (Yeates, 1967). On the other hand, Küss *et al.* (1965) reported on 86 cases of pyeloplasty and pyelolithotomy in which ureterostomy in situ was utilized for insertion of the ureteral splint catheter. Walsh (1967) also employed ureterostomy in situ as ureteral splinting in pyeloplasty of solitary kidney and heavily infected kidney, and recognized its usefulness. Especially Küss & Chatelain (1975) proclaimed their willingness to institute ureterostomy in situ for the purpose of temporary urine drainage in pyeloplasty for obstructed and infected kidney and congenital hydronephrosis at the time of upper urinary tract operation.

Fig. 1 summarizes the technique used in ureterostomy in situ. Firstly, it is used as permanent urinary diversion, and the indication is postrenal oliguria or anuria due to lower bilateral ureteral obstruction resulting from various kinds of advanced malignant tumor. Secondly, it is used as temporary urinary diversion. The indication is ureteral injury or ureteral obstruction due to resectable malignant tumor. It is performed as an emergency treatment for improvement of general conditions. Thirdly, it is combined with ureteropelvic reconstructive operation in a solitary kidney or heavily infected kidney as a temporary urine drainage when there is a possibility of urine leakage from the anastomosis, and also as a means to establish the ureteral splint catheter when it is necessary to prevent insufficient suture, crooked adhesion of the ureter or obstruction to urinary passage due to the tension on the anastomosed ureter. That is, the catheter insertion into the upper urinary tract by the ureterostomy in situ procedure has multi-purposes and can be instituted for different indications of individual cases. However, it has not gained wide acceptance. We used ureterostomy in situ for temporary urine drainage or for the institution of the ureteral splint catheter mainly in patients with ureteropelvic operation, and indeed confirmed its technical simplicity and many other merits.

Next, we would like to refer to precautions and complications in its practice.

First, Küss *et al.* (1965) performed urine drainage by ureterostomy in situ in place of nephrostomy and pyelostomy in 86 cases, in six of whom complications developed. Namely, they suffered persistent fever due to poor urine drainage through the catheter established by ureterostomy in situ. After removal of the catheter, cystoscopic ureteral catheterization was performed on five patients, and in one patient incised retroperitoneal abscess. Nephrostomy was performed on the remaining patient. Walsh (1968) conducted urine drainage by ureterostomy in situ in place of a nephrostomy tube in 150 cases, in only one of whom mild ureteral stricture was induced. He attributed it to the use of too large a catheter, and recommended the use of a catheter one size smaller than the ureteral lumen. Küss & Chatelain (1975) conducted ureterostomy in situ in a large number of cases, and stated: "Complications are very rare if the position of ureter is not disturbed. Stenosis and fistula have been seen only in a few cases in which the ureter was severely kinked".

Regarding our patients, the following points should be made. As an early complication, urine leakage was noted within the wound in nine patients. The complication disappeared in 2 to 3 days. Also, fever developed in five patients within 14 days after operation, later than 14 days in two patients, and after removal of the catheter in two patients. It was temporary in all of them, and no persistent fever was experienced. However, in one of the seven patients in whom the silicone tube was used as the catheter, the catheter's tip tore off and remained within the renal pelvis, subsequently bringing about frequent episodes of pyelonephritis. The silicone tube as a catheter to be retained in the body has little organic reactivity (Davis, 1967). However, since the tube is soft, it is liable to be come kinked and obstructed, and if it is thin, it is liable to tore off. Therefore, special care must be taken when using the silicone tube. Influence of the catheter insertion in the ureter was also investigated by post-operative DIP. One patient proved to have kinking and mild stricture at the point of the ureter where the catheter was inserted. Aside from the dissection of that point of the catheter's entrance, the catheter was guided to the abdominal wall at a sharp angle after being passed through the retroperitoneal cavity, so that the ureter was jacked up like a tent at the point of the catheter's entrance, and consequently the kinking and stricture of the ureter were induced. It should be emphasized that when ureteral splinting by ureterostomy in situ is employed, the ureter should be kept in situ without dissecting it from its position or altering its course, and that the catheter should be guided to the abdominal wall in a gentle curve along the ureter when it is passed through the retroperitoneal space.

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Ureterostomy in Situ: 尿管スプリントカテーテル法ならびに一時的尿ドレナージ法への応用

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要 旨: Ureterostomy in situ は, supravescical urine drainage 設置法として, 手技が簡単で侵襲も少ない方法である。しかしこの法は大凡30年前に発表されているにもかかわらず, いまだに普遍的な方法とはなっていない。私達は腎盂・尿管手術施行24例に ureterostomy in situ により尿管スプリント法, あるいは一時的尿ドレナージ法として腎盂・尿管内にカテーテルを留置し, 各々において, 所期の目的を達することができた。本法は手技が簡単であり, また症例の状態に応じて, 尿管スプリント法, 一時的尿管ドレナージ法, あるいは永久的尿路変更法などに応用しうる優れた方法である。それで本論文では施行例を紹介するとともに, 本手技を応用するときの注意点を検討し報告した。

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