Ureteral Stents

*Zafer UYSAL**
*Haluk ÖZEN***
*İlhan ERKAN***
*Doğan REMZİ***

Urologists are frequently confronted with complex ureteral disorders where some form of diversion is eventually needed. Previously, the solution to this problem consisted of standard surgical interventions, mainly proximal cutaneous diversions, which subjected the patient to operative morbidity and mortality, and also carried the burden of external catheters and collection devices.

A definite solution to this problem was first founded by Zimskind et al. (9) 17 **years ago, who proposed the use** of **self-retaining internal ureteral stents for long-term drainage. Since then several types of stents have been developed and the usefulness of this procedure has been supported by many reports** (2).

TYPES OF URETERAL STENTS

1. **Gibbons ureteral stents**
2. **Double-J and diversion stents**
3. **Polyethylene double-pigtail ureteral stents**
4. **Universal ureteral stents.**

Properties of An Ideal Stent

A. It must be soft, flexible, well tolerated and resistant to encrustations.

B. It must be radiopaque (2).

C. It must be uniform in diameter to provide ease in its insertion and withdrawal.

D. **It must have a design to prevent migration In both, cranial and caudal directions.**

E. It must withstand repeated autoclaving.

Gibbons Ureteral Stents

These stents are made of silicone rubber, which is unwettable and histologically inert to allow long-term implantation. The current model has a radiopaque tip and dentate protrusions and a distal radiopaque collar that has a retrieval tail to prevent stent migration (Fig. 1 and 2). **Its principal advantages are that it leaves a minimal amount of foreign body in the bladder and its distal flange allows minimal trigonal irritation** (3). **Its main disadvantages are difficulties in insertion, the requirement of a cystoscope with a large caliber and it's undesired in cases of ureteral fistula, since one of the side-wall protrusions could keep the fistula open.**

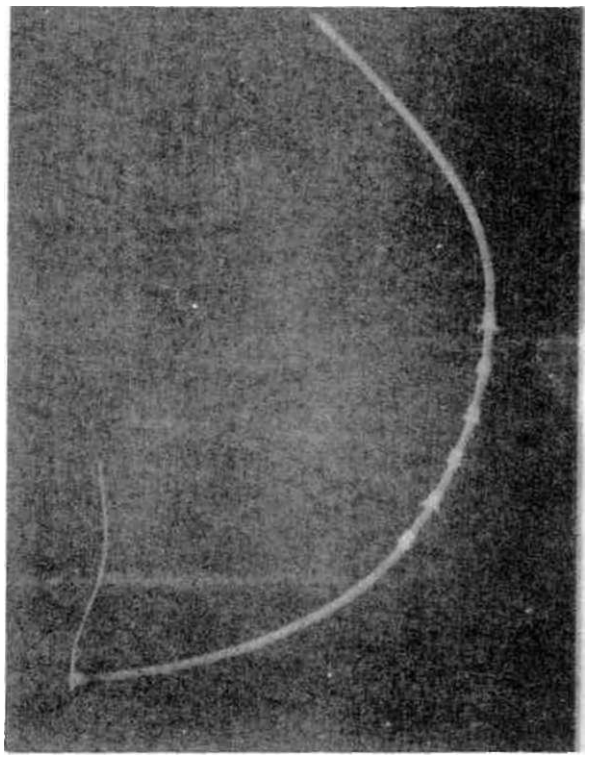


Figure-1. Gibbons ureteral stent

Double-J and Diversion Stents

These are silicone tubes with a J! formed on each end by a fine strand of silicone rubber (Fig. 3).

•Hacettepe Üniversitesi Tıp Fakültesi üroloji Anabilir» Dalı Araştırma Görevlisi
**Hacettepe Üniversitesi Tıp Fakültesi üroloji Anabilim Dalı Öğretim üyesi

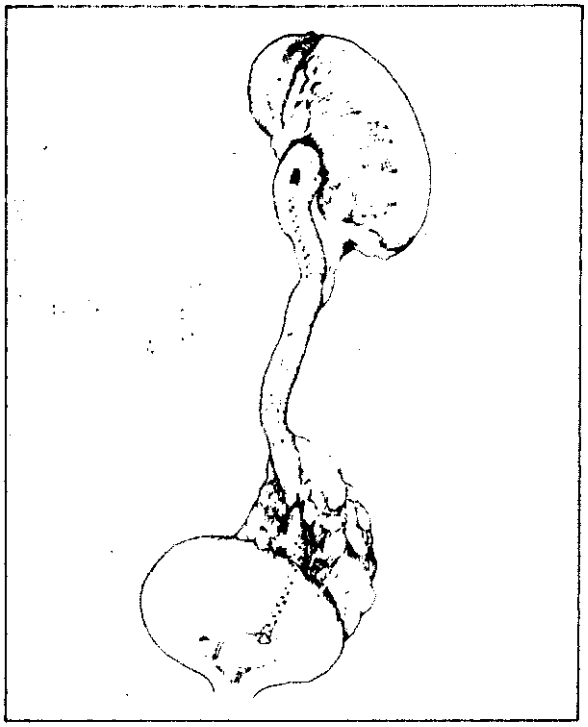
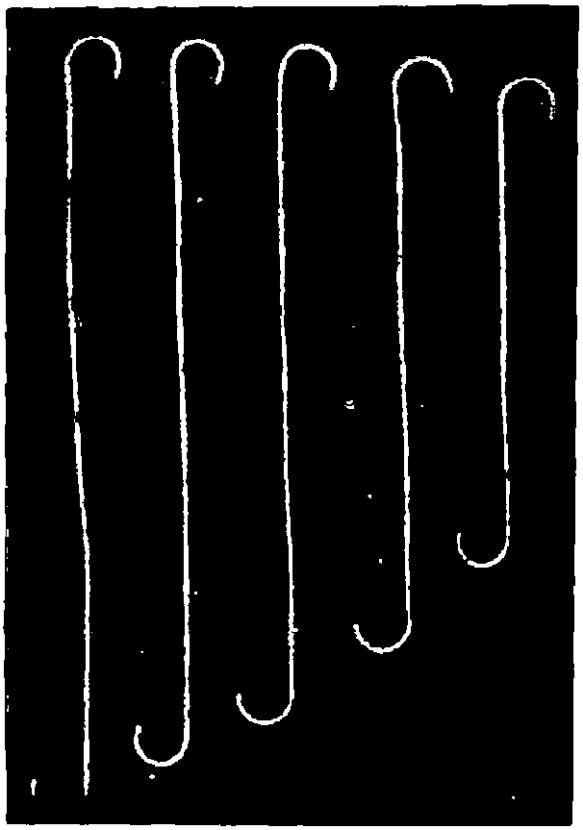


Figure-2. Final placement of a Gibbons ureteral stent



'igure-3. Different lengths of an 8.5 F double-J stent

While the stent is passed up the ureter, the J hooks are straightened with a wire and when the wire is removed, the J's are formed (1).

The stent kits are supplied with stents 6F, 7F and 8.5F in diameter and lengths of 16, 26, 28 and 30 cm. Drainage holes are provided every centimeter. They can be placed endoscopically or during an open operation (6, 9) (Fig. 4).

Diversion stents are used to drain the kidney after urinary diversion. The stent is 95 cm long—5cm shorter than the stylet wire— and has a ' J' only on the proximal end. It is used for external drainage and may be placed through a cutaneous nephrostomy, bowel diversion or may be inserted cystoscopically and brought out through the urethra. Drainage holes are provided only on its proximal end (Fig. 5).

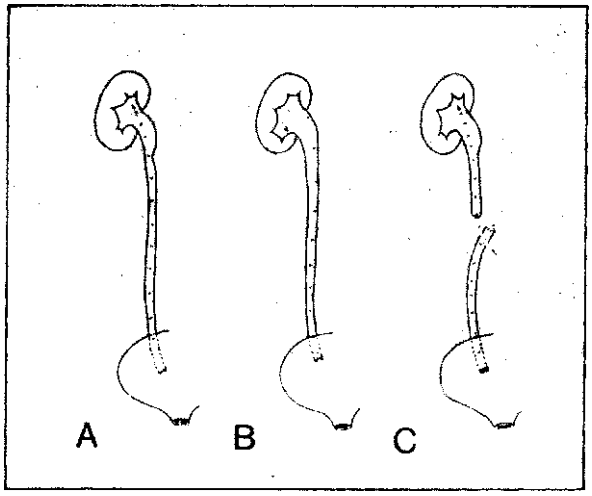


Figure-4. Methods of stent passage.
A and B, endoscopic placement.
C, open operative placement.

Polyethylene Double-Pictail Ureteral Stents

These stents are available with diameters of 5-8F and lengths of 8-30 cm. First, an open-end ureteral catheter is placed to the renal pelvis, a wire stylet is passed through this and the catheter is removed with stylet in place. Then, the stent is pushed over the stylet and finally when the stylet is removed, a double pig-tail form is obtained (Fig. 6). Its main property is migration resistance in both directions and trigonal irritation is its main disadvantage (4).

Universal Ureteral Stent

This is a 8F silicone rubber stent of 90 cm length. A percutaneous nephrostomy is performed and an 8F angiographic catheter is placed down to the bladder. Ureteral length is determined with a nephro-

stogram performed simultaneously. The stent is applied to a wire stylet passing through the anigographic catheter and the stent is placed in the bladder, pulling the angiographic catheter downward. A Luerlock system on the proximal end allows stent irrigation with desired solutions (7, 8).

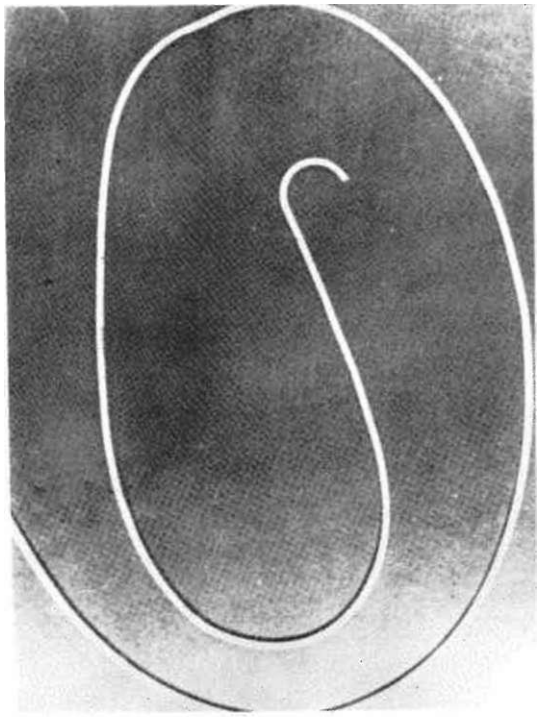


Figure-5. A diversion stent

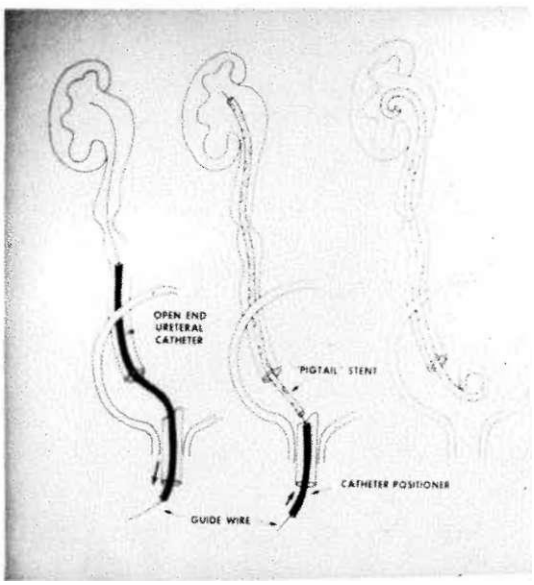


Figure-6. Placement of a pigtail stent

INDICATIONS FOR STENT USE (4)

I. Complex Benign Ureteral Disorders:

Ureteral injury:
- Cicatricial obstruction
- Suture obstruction
- Obstructive edema
- Ureterocutaneous fistula
- Ureterovaginal fistula

Post-operative drainage:
- Ureterointestinal conduit
- Pyeloureteroplasty (Fig. 7)
- Ureteroureteral anastomosis
- Uretereneocystostomy
- Ureterolysis

Retroperitoneal fibrosis

Multiple calculi

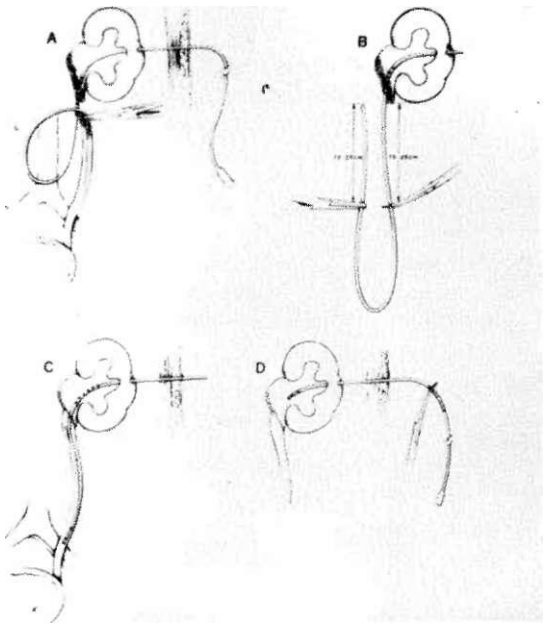


Figure-7. Stenting after pyeloplasty.
A, B, C, placement during operation.
D, the stent can be pulled back to the desired location, post-operatively.

II. Ureteral Diseases Associated With Unacceptable Operative Risk

Temporary Use

Permanent Use

HI. Ureteral Obstruction From Secondary Neoplasms

Genitourinary
- Prostate

Cervix
Ovary
Testis
Endometrium

Gastrointestinal
Rectum/colon
Gastric
Duodenum

Miscellaneous
Breast
Sarcoma
Lymphoma

PROBLEMS AND COMPLICATIONS DURING STENT DRAINAGE

1. Hematuria - usually due to traumatic insertion
2. Infection - foreign body reaction
3. Crystalloid encrustations.
4. Reflux
5. Trigonal erosion
6. Inadequate drainage
7. Stent migration in proximal and distal directions.

Infections induced by stents are usually unresponsive to antibiotics, but no significant morbidity has been reported. On long term usage, even if concommittent infection was not present, microscopic encrustations have been noted on all stents. This has been the least in polyethylene catheters and encrustation has not been a problem in a patient who had a stent for 24 months.

Measures to be taken are:

a) High fluid intake

b) Adjuvant medications, urine acidifiers, antibiotics to increase the solubility of urinary crystalloids.

b) Close patient follow-up (control of stent position and patency with pyelogram, cystogram and endoscopically).

RETRIEVAL OF STENTS

This is well accomplished by the use of:

a) Hooks
b) A 4-F Fogarty baloon catheter (5)
c) A nephroscope through the nephrostomy tract
d) A pyeloureteroscope
e) A transurethral biopsy forceps

CONCLUSION

Here in this review, we have tried to outline the basic properties and the principles in the management of ureteral stents, which is an ever growing element of endourology, having found many new applications that we have come to realize only recently. We strongly recommend that they be considered, when some form of urinary diversion is needed.

REFERENCES

1. Finney, R.P.: Double-J and diversion stents. The Urol. CI. of North Am., Feb. 1982.
2. Gibbons, R.P., Correa, R J. Jr., Cummings, K.B., et ai: Experience with indwelling ureteral stent catheters. J. Urol. 115:22, 1976.
3. Gibbons, Robert P.: Gibbons ureteral stents. The Urol. CI. of North Am., Feb. 1982.
4. Mardis, H.K., Kroeger, R.M., Hepperlen, T.W., Mazer, M.J., Kommandel, H.: Polyethylene double-pigtail ureteral stents. UroL CI. of North Am., Feb. 1982.
5. Niendorf, D.C., and Kahmi, B.: Retrieval of indwelling ureteral stent utilizing Fogarty catheter. Urology, 6:622, 1975.
6. Smith, A.D., Miller, R.P., Reinke, D.B., et al: Insertion of Gibbons ureteral stents using endourologic techniques. Urology, 14:330, 1979.
7. Smith, A.D., Lange, P.H., Miller, R.P., et al: Dissolution of cystine calculi by irrigation with acetylcysteine through percutaneous nephrostomy. Urology, 13:422, 1979.
8. Smith, A.D.: The universal ureteral stent. Urol. CI. of North Am., Feb. 1982.
9. Zimskind, P.D., Fetter, J.R., and Wilkerson,J.L.: Clinical use of long-term indwelling silicone rubber ureteral splints inserted cystoscopically. J. Urol., 97:840, 1967.