STENTS IN UROLOGY

TYPES, USES, COMPLICATIONS AND EFFECT ON PATIENT

Essay

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✍ Youssef Atef Youssef

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List of Abbreviations

AUR	Acute urinary retention
BOO	Bladder outlet obstruction
BPE	Benign prostate enlargement
BPH	Prostatic hyperplasia
DSD	Detrusor-sphincter dyssynergia
ILCP	Interstitial laser coagulation of the prostate
LGA	Lactic-co-glycolic acid
LUTS	Lower urinary tract symptoms
PCNL	Percutaneous nephrolithotomy
PGA	Polyglycolic acid
PLA.....	Polylactic acid
TUMT	Transurethral microwave thermotherapy
TURP	Transurethral resection of the prostate
UTIs	Urinary tract infections
VLAP	visual laser ablation of the prostate

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AIM OF THE WORK

The purpose of this essay is to review urologic stents, their different types, indications, potential morbidity and future prospects including ureteral, prostatic or urethral stents.

USES OF URETERAL STENTS

The use of the indwelling ureteral stents has become an essential part of the urologist armamentarium. Indwelling ureteral stents provide free drainge from the kidney to the bladder, reduce or eliminate urinary leakage and provide ureteral stenting. However their use is not free of complications and problems ***(Wang et al., 2010).***

Historically, the first clinical application of ureteric catheter was reported in1967. The common problem with stents was their tendency to migrate. In 1978 Finney described the double J stent, having hooks on either end to prevent upward and downward migration, which since has been adopted as the indwelling ureteral stent ***(Watterson et al., 2002).***

Uses of stents in stones:

Stents for ureteral stones:

Acute ureteral obstruction, most commonly due to calculi, may be decompressed with a ureteral stent. Extracorporial Shock Wave Lithotripsy ''ESWL'' is recommended as first line treatment for most patients with stones 1 cm or less in the upper ureter ***(Sanata et al., 2007).***

The procedure can be performed with or without stent placement, ESWL of ureteral calculi can be performed by three specific treatment methods:

(i) Push calculi into the renal collection system**.**

(ii) Bypass of the stone with a stent**.**

(iii) In situ with no manipulation.

(Rane et al., 2008)

Although pre-treatment stenting offers no advantage in stone-free rates in the treatment of middle ureteral calculi with ESWL, stenting may aid in the localization of calculi overlying the bony pelvis, particualry in the presence of significant ureteral obstruction that diminishes the efficiency of intravenous contrast in aiding stone localization ***(Deosttedt et al., 2004).***

Placement of a ureteral stent has been the standard of care following ureteroscopy**.** The main advantage of a postoperative ureteral stent is to prevent obstruction related to stone fragments or ureteral edema from ureteral dilatation**.** Furthermore, passive ureteral dilatation by the stent is thought to facilitate passage of stone fragments when the stent is removed. Stenting the ureter is also thought to prevent ureteral stricture formation and to facilitate ureteral healing.Disadvantage of ureteral stents include morbidity associated with stents as infection, dysuria, flank pain, hematuria, or stent migration ***(Joshi et al., 2004).***

The miniaturization of ureteroscopes combined with the recent advances intracorporeal lithotripsy devices, notably the introduction of the holmium:YAG (Yetrium Aluminum Garnet) laser which cause stone fragmentation with minimal ureteral wall trauma, has led clinicians to hypothesize that ureteral stenting is no longer necessary following uncomplicated cases.Randomised controlled trials demonstrated that not all patients require routine stenting after ureteoscopy. The first report to demonstrate that ureteroscopy patients did not routinely require a ureteral stent, was a case series study without control group, submitted by Hosking **et al.,** 1999. Then several randomised controlled trials have shown that nonstented patients did not have more complications than stented group ***(Denstedi et al., 2001; Byren et al., 2002; Damiano et al., 2004).***

Tanriverdi et al.(2011)reported that ureteral stenting after ureteroscopoy is not routinely necessary and should be determined on a case-by –case basis. Ureteral stent is highly recommended in the following indications:

- Ureteral perforation intraoperatively.
- Ureteral dilatation greater than 10 Fr.
- Significant ureteral edema due to stone (e.g., impacted stone).
- Failure to advances the ureteroscope due to a narrow ureter or ureteral orifice and in preparation for subsequent ureteroscopy after 7 days.

- Infected urinary system with an obstruction.
- Large stone burden with many fragments remaining to pass.
- Solitary kidney.

Stents for renal stones:

Indications for ureteral stenting with ESWL of renal calculi are less defined Stenting can be performed as a therapeutic or prophylactic procedure prior to ESWL. Therapeutic stenting prior to ESWL is indicated in the following conditions:

(i) Renal failure secondary to bilateral obstructing calculi or an obstructing stone in a solitary kidney.

(ii) Obstructive pyelonephritis secondary to a stone

(iii) Refractory renal colic or pain.

(iv) Relief of high grade or long term obstruction.

(Nakada et al., 1995)

Moreover, if a stone is dislodged into the renal pelvis during ureteral stone manipulation**,** it can be maintained in the kidney by a stent until treatment by ESWL, alkalinization or percutaneous nephrolithotomy (PCNL). The majority of percutaneous surgery for renal stone disease can be performed without the need for post-operative ureteral stenting. Specific indications for postoperative

stenting include extensive perforation of the collecting system, need for subsequent ESWL for large burden stone disease, ureteral obstruction due to edema or stone fragments, and persistent urinary leakage following removal of the nephrostomy drainage catheter ***(Smith et al., 2007).***

Stents for stricture and ureteropelvic junction obstruction:

Endoscopic approaches to ureteral stricture disease have supplanted the traditional role of open surgery in adults. Despite the overwhelming use of endoscopic techniques as endoincision or dilatation in treatment of ureteral stricture disease, debate continues over the size of the stent and the optimum duration of postoperative stenting. Stenting is an integral part of ureteral endoincision that prevents leakage of urine into the retroperitoneum and provides a mold over which ureteral epithelium can grow. Also patients with ureteropelvic junction obstruction may be unfit for immediate surgery, so placement of a temporary ureteric stent will decompress the kidney and allow time for the patient's condition to improve ***(Slaviset al., 2007).***

Stents for obstructive urosepsis:

Ureteral stenting and percutaneous nephrostomy (PCN) drainage are complementary procedures that are crucial in the managementof an obstructed upper urinary tract. When a patient presents with an infected**,** obstructed kidney, urgent decompression

and drainge is priority, The use of either stent or nephrostomy in this particular clinical setting continues to spark debate and the choice is usually driven by surgeon preferance and skill, presence of skilled intervntional radiologists or urologists trained to perform PCN, operating room availability, and stone characteristics. The advantage of ureteral stenting is the complete internalization of the stent without the need for an external drainage device ***(Pearie et al., 2006).***

Stents for reteroperitoneal fibrosis:

In cases of reteroperitoneal fibrosis ureteric stents are used to relieve the ureteric obstruction which may be caused by benign or malignant reteroperitoneal fibrosis ***(Vaglio et al., 2006).***

Ureteral stenting in pregnancy:

Renal colic is the most common non-obstetric cause of acute abdominal pain during pregnancy. Azotemia, fever or sepsis with urinary obstruction during pregnancy require percutaneous nephrostomy or ureteral stent drainge and the gravid state does not alter this approach ***(Strothers et al., 2003).***

Most studies report that approximately two thirds of stones pass spontaneously during pregnancy. Stents should be changed in gravid states at approximately six-week interval***(Sofer et al., 2008).***

Ureteral stenting in cancer patient:

Nephrostomy has been the standard procedure for urinary diversion when ureters are obstructed by cancer. The indwelling ureteral stent eliminates many of the problems related to the nephrostomy as sepsis. Paul **et al.,** 2009, reported that simaltaneous placement of two double-J ureteral stents for the management of ureteral obstruction secondary to an extrinsic compression by malignancy is a safe and effective technique ***(Paul et al., 2009).***

Uses of stents in renal transplantation:

Chronic ureteral obstruction continues to be a difficult clinical problem, whether the etiology is malignant or benign.Management options have traditionally been limited to open resection or reconstruction in patients who are surgical candidates versus double-J stents or percutaneous nephrostomy tubes in patients who are not. The Resonance stent has been advertised in situ lifes pan of 12 months and higher radial strength, in theory increasing resistance to external compression, decreasing cost/morbidity of stent changes, and pre-cluding need for PCN tubes. Initial results were uniformly positive, with early data indicating stents could maintain good functionality with minimal encrustation despite lengthy periods of time in situ ***(Mark et al, 2013).***

Ureteral fistulas are frequent urological complications observed in renal transplantation ***(Eschwege et al., 2006).***Several prospective studies have concluded that ureteral stenting is benficial in reducing the rate of vesicoureteric leakage and obstruction in renal transplantation ***(Benoit et al., 1996; Sansalone et al., 2005).***Other investigations concluded that routine ureteric stenting is unnecessary in kidney transplantation in patients at low risk for urological complications, there was no difference between groups of study as regard obstructions or leak ***(Dominguez et al., 2004).Osman et al., 2005*** reported that routine ureteric stent inseration has no impact on the rate of vesicoureteral leakage or obstruction in live-donor renal transplantaion, whereas it is significantly associated with an increased incidence of urinary tract infection.

Borden et al., 2006, found that the repeated stenting is a viable treatment option for selected patients with renal allograft ureteral obstruction.

Tandem double J stents ara a viable option with low associated morbidity for the management of recurrent and recalcitrant ureteral stenosis after kidney transplantation that has failed previous ballon dilatation or ureteral reconstruction ***(Ricardo et al., 2011).***

Uses of stents in trauma:

Ureteral injuries can be secondary to an external trauma either blunt or penterating, which is mostly associated with other injuries, or more commonly iatrogenic**.**A high index of suspicion is mandatory to diagnose ureteric injuries and to prevent morbidity, as intial radiographic studies and urinalysis may be nondiagnostic. Principles of open surgical repair of limited injuries include debridment and spatulation of the ureter, then tension free closure with absorable suture over an indwelling stent. Delayed diagnosis of missed or iatrogenic injuries may be treated by percutaneous drainage of urinoma and reterograde or antegrade placement of a ureteral stent, provided that the ureter is at least partially intact ***(Steers et al., 2003).***

Following tangential injury to a portion of the ureter by penterating trauma or following a clamp or suture injury, passage of an indwelling ureteral catheter may allow complete healing of the ureter and reasonable long term results. Lastly, ureteral stents may be used safely and effectively to treat persistent or recurrent urinary extravastion resulting from major renal trauma in appropriately selected patients ***(Medina et al., 1998; Andriole et al., 2007).***