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RESEARCH

Office-based ureteral stent placement and stent exchange using mild sedation, local anesthesia, and no fluoroscopic guidance: safety, efficacy, and feasibility

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Abstract

Ureteric stent exchange and stent placement are traditionally performed under general anesthesia with fluoroscopic guidance. We conducted a retrospective analysis of patients who underwent ureteric stent exchange or stent placement in an office setting from April 2020 to May 2023. Stent placements were attempted in patients with a success rate of 80% and stent exchanges were also performed with a success rate of 94.7%. This technique not only yielded comparable success rates to operating room (OR) procedures under general anesthesia and fluoroscopic guidance, but also utilized fewer resources, offered increased convenience for urologists, and reduced both time and cost for patients.

Keywords: Feasibility studies, stents, treatment outcome, ureter, ureteral obstruction, ureteroscope

Introduction

Ureteral stent placement is a widely utilized technique in urology, primarily indicated for conditions such as obstructing ureteral stone with infection, intractable pain, acute kidney injury, or tumors [1]. In addition, patients often require repeated stent exchanges for ureteral stricture and external compression from retroperitoneal fibrosis or malignancy [1]. Traditionally, ureteral stent placement and exchange are performed under general anesthesia with fluoroscopic guidance [2]. The covid-19 pandemic posed significant challenges for urologists, due to overwhelmed hospital resources and limited operating room (OR) staff affecting the management of acute renal colic caused by obstructing stones [3]. While the suspension of all non-emergency urological intervention was advised, obstructing and infected stone disease presents a unique condition that requires emergent intervention to prevent significant morbidity and possibility mortality [4]. Since the pandemic, emergency restrictions have been eased and there has been a worsening shortage of healthcare professionals, including anesthesiologists, surgical registered nurses, radiologic technologists, and surgical technologists [5-12]. As such, hospital capacity to perform general anesthesia procedures is increasingly constrained despite easing of restriction related to the pandemic [5-12].

To avoid delays in stent placement during the pandemic and to offload procedures from the hospital OR in its aftermath, we instituted a protocol to perform ureteral stenting as an office-based procedure with mild sedation without fluoroscopic guidance. This approach was later extended to patients undergoing chronic stent changes. We present our experience with office-based ureteral stent placement and exchange with only local anesthesia and without intraprocedural fluoroscopic guidance.

Case Series

We conducted a retrospective analysis of patients who underwent office-based ureteral stent placement or exchange from April 2020 to May 2023. Patients who presented with severe renal colic due to obstructing stones were offered immediate office-based ureteral stent placement in an office cystoscopy suite. We emphasized a shared decision-making model with thorough discussion regarding the risks and benefits of an office-based approach, including deviation from the standard operating room stent placement under general anesthesia. Patients with anatom-

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ic abnormalities precluding positioning in the office, large stone burden (single stone > 10 mm or multiple stones) or have had previous complications with stent placement were not offered office stent placement. Written informed consent was obtained from all patients. Patients received 10 mg oral diazepam two hours prior and 15 mg intramuscular ketorolac immediately before the procedure. Prophylactic antibiotics, either 500 mg oral cephalexin or 100 mg oral nitrofurantoin was administered. Male patients were positioned supine, while female patients were in the frog leg position. A 2% lidocaine lubricant jelly was instilled per urethra for 5 minutes and patients were prepped and draped according to standard practice for office cystoscopy. Flexible cystoscopy was performed with a standard 16 French (Fr) flexible cystoscope. Under direct vision, a 0.035" stiff hydrophilic nitinol wire (Terumo™ Stiff Glidewire®) was passed into the kidney until there was a resistance indicating coiling in the kidney. In addition, both patient feedback indicating flank pain and efflux of obstructed urine was also used to gauge whether the wire was correctly placed in the renal pelvis. The wire was directly visualized via cystoscopy to ensure that it is moving forward into the ureter without coiling in the bladder.

A 4.5 Fr stent (Gyrus ACMI Tecoflex™ double pigtail ureteral stent) was then passed through the scope over the wire using a 5 Fr open ended catheter as a pusher until the distal tip was visualized at the bladder neck. It was then deployed by removing the wire.

Figure 1. KUB confirming stent placement into the renal pelvis after stent exchange.

Similarly to primary stent placement, stent exchanges were only offered in the office setting when it was anticipated to be straightforward. For examples, patients with stent that were overdue for exchange, but with known difficult anatomy or challenging stent changes in the past were not offered office stent exchange. For stent exchanges, cystoscopy was carried out as above. An 8 mm stent grasper was then used to pull the stent to the urethral meatus. The wire was then passed through the stent up to the kidney as above. The old stent was removed, and a new 4.5 Fr stent was deployed over the wire using a finger at the meatus for women. For men, the wire was backloaded through the scope and the stent was placed under direct vision. No intraprocedural fluoroscopy was used. After stent placement, KUB X-Ray was done to confirm stent position (Figure 1).

Results

We performed 24 office-based ureteral stenting procedures on 10 patients (3 male and 7 female) with a mean age of 64.9 years and mean BMI of 27.8 kg/m^2. Stent insertions were attempted in five patients with obstructing ureteral stones, resulting in a success rate of 80% (unilateral = 4), defined as successful placement without having to repeat the procedure in the OR room or post-op complications within one month of the procedure. In addition, nineteen stent exchanges for five different patients were attempted. There was a success rate of 94.7%. The reasons for stent placement were as follows: ureteral stricture caused by fibrosis resulting from common iliac vascular stenting, previous retroperitoneal or pelvic radiation in three patients with gynecologic cancers, ureteral obstruction due to fibroids in one patient, and another patient presenting with ureteral stricture and hydronephrosis without clear etiology. In most cases, it was evident that the wire had passed the stone due to the immediate efflux of urine into the bladder. Stent placement failed in one case due to overfilling of the bladder causing acute angulation of ureteral orifice. One stent exchange failed as the new stent would not pass the stricture. Both failed attempts were repeated successfully under general anesthesia in the operating room and using fluoroscopic guidance.

Of note, no patients had pain requirements in addition to the preoperative ketorolac. Although hematuria did occur, there were no cases in which it was significant enough to generate an unexpected phone call, office visit, or emergency room visit. There were no documented urinary tract infections for patients who underwent office-based stent placement or exchange.

Discussion

Office-based procedures such as diagnostic flexible cystoscopy, stent removal, and cystoscopy monopolar fulguration of small bladder tumors have been successfully

performed in urology [13]. Ureteroscope procedures, including removal of migrated stents, surveillance ureteroscopy, upper tract bacillus Calmette-Guérin instillation, and ureteroscopic lithotripsy have also been reported in office settings but are not commonly performed [13].

Ureteral stenting is classically performed under general anesthesia in the operating room using fluoroscopic guidance [2, 13-15]. However, the covid-19 pandemic led to resource constraints, including a shortage of OR staff, making traditional ureteral stent procedures challenging [3, 5]. In our study, we successfully implemented a protocol for office-based ureteral stent placement and exchange using minimal sedation, local anesthesia, and without intraprocedural fluoroscopy.

Previous studies have shown that ureteral stents can be safely placed under local anesthesia with a success rate of 85%-89% with fluoroscopy [15]. In fact, many urology offices are now equipped with cystoscopy suites with fluoroscopy equipment and technicians available. Our series had a similar success rate of 80% without the use of intraprocedural fluoroscopic guidance and provides an alternative method in the case that staff or equipment are not available.

Ureteral stenting under local anesthesia in an office setting has been a common urological procedure. However, the majority of studies in the literature describe the use of additional imaging for guidance. A study by Mark and Montgomery was one of the first to demonstrate that stent placement could be used under local anesthesia using a cystoscope in an outpatient setting, but in this series they used intraoperative fluoroscopic guidance [16]. Similarly, other studies have shown that the initial placement of a ureteral stent can be done in an office setting with local anesthesia. Both Doersch *et al*. and Adeyoju *et al*. report techniques that use of intraoperative fluoroscopy while Sinha *et al*. demonstrated the use of ultrasound guidance to confirm correct stent placement prior to sending the patient for confirmatory KUB [14, 17, 18]. In our study, we demonstrate that in outpatient settings where imaging is not available, it is safe and feasible to place or exchange ureteral stents without the use of intraoperative fluoroscopy or ultrasound.

The procedure that we have outlined provides a way to perform ureteral stent placement and exchanges that uses less equipment and personnel than other studies. Gershman *et al*. showed that both stent placement and stent exchange could be performed in an office-based setting [19]. However, they used fluoroscopic guidance, which may not always be available. Another study compared the use of local anesthesia vs. general anesthesia for stent placement on a total of 119 patients, but they also used fluoroscopic guidance [20]. Our study supports that stent placement or exchange can be comfortably performed under local anesthesia without fluoroscopic guidance. We found one study that was very similar in technique to ours. Bailey *et al*. shows ureteral stent placement using local anesthesia without fluoroscopic guidance, but this was done at bedside in the ED using conscious sedation [21]. By reporting this case series, we seek to add to this literature by demonstrating that office-based stent placement and exchange is safe and feasible.

Patients that need reoccurring stent exchanges from malignant ureteral obstruction or stricture would likely benefit the most from an office-based procedure. It is recommended that chronic ureteral stents be exchanged every 3 to 4 months [22]. Sivalingam *et al*. showed that stents placed under local anesthesia cost $11,037, in comparison to $30,741 under general anesthesia [20]. A study from Connelly *et al*. showed the cost of stent insertion in the operating room was $16,349.91, but in the clinic it cost $7,865.69 [23]. Finally, Gershman *et al*. revealed that ureteral stent exchange performed in the office *vs*. in an ambulatory suite saved $1,706 per procedure [19]. Having the ability to perform repeat stent exchange in the office provides an opportunity to greatly reduce the financial burden on patients, in addition to the avoidance of general anesthesia.

Although all local guidelines and laws regarding mild sedation were followed during these office procedures, we recognize that even mild sedation can sometimes lead to poor outcomes. Benzodiazepines, such as diazepam, can lead to respiratory depression. Further, instrumentation of the urinary tract, especially the ureter and kidney can be quite painful, which may lead to vasovagal responses in some patients. We acknowledge that having an anesthesiologist or APP available for bedside monitoring would be recommended and strict protocols if such events should occur need to be established and educated to staff.

Sinha *et al*. showed that the procedure was quickly learned by urology residents in a high-volume center [18]. They demonstrated that the procedure was quickly learned by urology residents in a high-volume center. Trainees took 12 minutes to perform the procedure in their first 10 cases but halved this to 6 minutes after 30 cases [18]. In our case, we expect similar 10-30 cases to be required to reach competency for a urologist in training. They further found that the most common reasons for failure of ureteral stenting was difficulty with visualizing the ureteral orifice due to turbid urine, edematous ureteral orifice, bladder clots, blocked stent during stent exchange or buckling of stent in the bladder. In our series, one patient had a failed attempt due to discomfort from prolonged procedure and overdistended bladder causing acute angulation of the distal ureter and subsequent buckling of the stent. This was improved once we switched to the 0.035 stiff glide wire, instead of the 0.038 hybrid wire. The superior lubricity of the hydrophilic coating allows stents to pass over the wire and around stones with less resistance.

The major limitation of our study is the small number of patients, retrospective analysis, and lack of a control group. To further assess the safety and feasibility of this procedure, a prospective comparison with stent placement with fluoroscopic guidance as an office-based procedure could be conducted. Deeper exploration of the cost-effectiveness of office-based stent placement and stent exchange compared to OR-based procedures could provide

impetus for further investigation. Finally, the learning curve of office-based stent placement should be assessed as there are steps in this technique which trainees are exposed to less often.

Conclusions

We demonstrated that office-based ureteral stent insertion and exchange can be performed safely and effectively without fluoroscopy and with mild sedation and local anesthesia only. Further studies are required to investigate predictors of success, cost-effectiveness, and learning curve to support its routine use.

Declarations

Ethical statement: This study was approved by the Institute Research Medical Ethics Committee. Written informed consents were obtained from all the patients involved.

Availability of data and materials: Not applicable.

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Conflicts of interest: Not applicable.

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