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Noncystoscopic removal of retained ureteral stents in children

A retrospective study from a single-center

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Abstract

Cystoscopic technique is the current common method of retrieving double J ureteral stent in most pediatric urological centers. In this study, we evaluated the feasibility and efficacy of a novel noncystoscopic method to remove retained ureteral stents in pediatric patients.

We reviewed all medical records from a total of 102 patients who were treated in our hospital between January 2013 and December 2016 to remove the double J ureteral stent retained into the ureter. The pediatric patients were divided into 2 groups based on different surgical options: cystoscopic group and noncystoscopic group. The surgery time (including time for instrument preparation), operation time, expenses, postoperative urination discomfort, and hospitalization were compared between the 2 groups.

The noncystoscopic group took significantly less time for surgery and operation than the cystoscopic group (surgery time:7.40 ± 3.75 vs 18.42 ± 2.77 min, $P < .05$; operation time: 3.54 ± 2.03 vs 4.48 ± 2.04 min, $P < .05$). The mean spending for patients in the noncystoscopic group were less than that in the cystoscopic group ($736.70 ± 105.96 vs $618.23 ± 110.31, $P < .05$). There were less children with postoperative urination discomforts in the noncystoscopic group than that in the cystoscopic group (8 vs 20 cases, $\chi^2 = 4.241$, $P < .05$). The mean hospitalization of the noncystoscopic group was shorter than that of the cystoscopic group (3.20 ± 1.25 vs 4.13 ± 1.63 d, $P < .05$). The differences in all comparison projects were significant.

The noncystoscopic procedure is a safe and viable technique that may be used successfully in pediatric urology. This novel procedure which is much safer and more affordable provides an alternative solution to remove retained ureteral stents in child patients.

Abbreviations: Fr = French, KUB = plain film of kidney–ureter–bladder.

Keywords: children, double J ureteral stent, noncystoscopic

1. Introduction

Retaining double J ureteral stent has become a common practice in various urological surgeries since Finney[1] first elaborated a ureteral double J stent in 1978. Today, a double J stent is usually used to provide direct drainage of pediatric upper urinary tract obstruction after manifold surgeries, such as ureteral reimplantation, pyeloplasty, and ureteral dilatation. A double J stent is typically removed by using a cystoscope under local anesthesia. To eliminate the cystoscopy and reduce the application of narcotic drugs, surgeons have made some advanced attempts in the procedures which were reported in the literature.[2–4] Nevertheless, they cannot be accepted by the physician and patients due to the obvious flaws in all these clinical trials, such as costliness, infection or uncomfortableness. In this report, a novel technique without cystoscope has been introduced to remove the retained double J stent under minimal sedation which evidently reduces operation time, costs, postoperative urination discomfort, and hospital stays compared with the cystoscope-assisted procedure.

2. Materials and method

Medical records of a consecutive series of pediatric patients undergoing surgery to remove the double J ureteral stent between January 2013 and December 2016 were reviewed. All the patients had accepted the first stage operation and indwelt just 1 double J stent, such as pyeloplasty and ureteral reimplantation. A total of 102 patients, 67 boys and 35 girls, aged from 1 month to 13 years old were included in this study. Stents were indwelling for an average of 7 weeks (range 4–12 weeks). Kidney–ureter–bladder and urinary laboratory tests were performed in all patients in hospital before the surgeries, and indicated a proper placed stent

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Informed consent: Informed consent was obtained from all individual participants included in the study.

The authors have no conflicts of interest to disclose.

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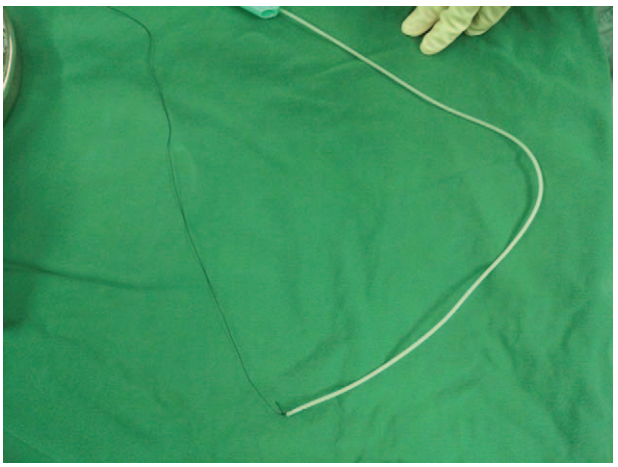

Figure 1. A self-made tool to remove the stent.

Figure 2. Pulled out the tool tightly with the ureteral stent.

and no urinary tract infection. All the patients were divided into 2 groups: cystoscopic group and noncystoscopic group based on different surgical options. Taking controlling of patient age, gender, side of surgery, and the first operation, we attempted to minimize the potential for selection bias between surgical modalities.

Patients in the cystoscopic group received propofol intravenous and nitrous oxide inhalational mixed anesthesia before the procedure. During the process, the children were placed in the lithotomy position. A retrograde cystoscope (Storz 27005BA HOPKINS II Telescope 30°) was inserted into the bladder to find the end of the stent after injecting tetracaine hydrochloride mortar into urethra for lubrication. After that, the stent was taken out with a medical grasper.

Patients in the noncystoscopic group just received minimal nitrous oxide inhalational anesthesia and were in the supine position. Instead of cystoscope, we manipulated a self-made tool to remove the stent[5]: a 3-0 monofilament suture was sewed on the end of an Fr5 feeding tube to create an open loop (Fig. 1). After injecting tetracaine hydrochloride mortar into urethra for lubrication, the tool was inserted into the bladder till the urine outflow from the feeding tube and then further for 10 cm. Afterwards, we gently pulled and rotated the device for several rounds. When we felt the resistance from the device, we pulled out the tool tightly with the ureteral stent (Fig. 2). If we failed 5 times, we would remove the stent with cystoscope.

All the patients were sent to postanesthesia care units after the surgeries. The surgery time, including time for instrument preparation, is measured from the completion of anesthesia procedure to the end of the whole surgery. The operation time is calculated from injection of urethral lubricant till removal of the double J stent. The patients were discharged home when they felt comfortable.

The SPSS version 17.0 was used for statistical analysis. Quantitative variables were compared using the t test. Qualitative variables were compared using the χ^2 test. Statistical significance was accepted at a P value of $<.05$.

3. Results

Table 1 showed the characteristics of the 102 pediatric patients. There were no significant differences between 2 groups in general information. All patients underwent operations successfully except 2 patients in the noncystoscopic group. So these 2

Table 1

Clinical features of 102 pediatric patients.

	Cystoscopic	Noncystoscopic	t (χ^2)	P value
Number	55	47		
Age, years				
<1	27 (49.1%)	20 (42.6%)		
1–5	14 (25.5%)	12 (25.5%)	$t=-0.809$	.421
>5	14 (25.5%)	15 (31.9%)		
Sex				
Male	38 (69.1%)	32 (68.1%)	$\chi^2=0.012$	.913
Female	17 (30.9%)	15 (31.9%)		
Location				
Left	32 (58.2%)	27 (57.4%)	$\chi^2=0.006$	.940
Right	23 (41.8%)	20 (42.6%)		
Operation				
Pyeloplasty	34 (61.8%)	28 (59.6%)		
Reimplantation	17 (30.9%)	14 (29.8%)	$\chi^2=0.419$	.872
Other	4 (7.3%)	5 (10.6%)		

Table 2

Comparison of operative and postoperative data between 2 groups.

	Group			
	Cystoscopic	Noncystoscopic	t (χ^2)	*P* value
Mean surgery time, min	18.42±2.77	8.04±4.82	t=13.571	<.001
Mean operation time, min	4.48±2.04	3.54±2.03	t=2.32	.022
Mean expenses, $	736.70±105.96	618.23±110.31	t=5.523	<.001
Discomfort	20 (36.4%)	8 (17.0%)	χ^2=4.761	.029
Hospitalization, day	4.13±1.63	3.20±1.25	t=3.127	.002

patients had operations with cystoscope instead. There were no remarkable differences (Fisher exact test, $P<.05$) in rates of success between the 2 groups. The average surgery time and operation time for the cystoscopic group were significantly longer than these for noncystoscopic group. The average expenses of cystoscopic group were more than that of the noncystoscopic group. In the cystoscopic group, 20 patients had obvious discomforts in urination including frequent micturition, painful urination, dysuria, and hematuria; while in the noncystoscopic group were 8 patients, the difference was significant. These symptoms lasted for 2 hours to 3 days and disappeared spontaneously. The significantly longer average hospitalization time was observed in the cystoscopic group compared with that in the noncystoscopic group. The results are listed in Table 2.

4. Discussion

With the development of pediatric urology, stenting came into favor by pediatric urologists. Stents are commonly used to maintain ureteric patency after urinary surgery, such as ureteral reimplantation, pyeloplasty, and so on. A double J ureteral stent is one of the most favorite stents in pediatric urology, for it can maintain ureteric patency, preserve the anastomosis alignment and effectively prevent urine leakage. It is reported that retaining double J ureteral stent can reduce hospitalization time, postoperative complication, and the additional treatments, and make earlier improvement compared with nonstented pyeloplasty.[6,7] There are, however, some crucial shortages of double J ureteral stent such as a necessary second operation for stent removal. The traditional method to remove the stent with cystoscope needs a second hospitalization and general anesthesia. This second procedure is known to cause additional risk, such as dysuria and hematuria. These symptoms are related to the invasive procedure with cystoscope. What is more, this procedure needs a substantial medical expense to patients. Consequently, producing a novel technique, which cut down the risks and expenses of stent displacement, is highly desirable.

So far, some improvements have been developed to avoid secondary procedures. Taveres et al[8] presented a technique for inserting an internal–external nephroureteral stent during a laparoscopic pyeloplasty. An internal–external stent is advanced under direct vision downward into the ureter at assistance of an angiocatheter which was inserted earlier. The key advantage of this stent is that it can be removed without exposing the patients to an additional general anesthetic or cystoscopy for removal. However, the risks of parenchymal injury and bleeding could not be eliminated. Additionally, the proper drainage is likely to be disrupted because of the small diameter of stent. Yucel et al[9] described the application of a dangler secured to penile shaft in boys. Although their method could avoid general anesthesia for stent removal, the dangler is only limited to male and makes patients uncomfortable. Moreover, the results presented in the study imply that the procedures do not have excellent reproducibility.

In this study, we repeated a new double J stent removal procedure which was reported in a recent article.[5] The stent could be removed safely and quickly in a few minutes without the need of cystoscope. Less amount of exposure to anesthetics and correspondingly less damage being caused to the patients benefit from the fewer surgery time and lighter urinary irritation. With the more flexible tube compared to the sheath of cystoscope, the urethral injury is milder. Moreover, there would be fewer chances for iatrogenic reflux and infection without continuously flushing water to bladder during operation.[5] Lower complication rate in noncystoscopic group of our study demonstrates that the noncystoscopic procedure decreases the incidence of iatrogenic urinary injury. Therefore, the patient had a shorter hospitalization time, which could reduce the cost. This new method requires an additional feeding tube and a monofilament suture compared to a cystoscope, which costs just about 3 dollars in our country. What is more, the feeding tube and suture which form the instrument can be found in nearly all the operating room and all of urologists can mastered the application of the technique by simple learning and training. Last but not least, this new procedure success exceeded 95% in our study. This result demonstrates that the new procedure is simple and reliable.

This procedure also has some minor limitations and flaws. In our study, we have 2 failure cases in the noncystoscopic group. We removed the stents with cystoscope and found the spaces of the 2 bladders were so large. The 2 patients, aged 11 and 13, were older than most of other patients. It is well known that the children with older age have larger bladder capacity. We believe that it could be the reason why the device could not catch the stent. Therefore, we probably have difficulty in applying this new technique on the old children and adult patients. A further clinical trial will be essential in our future study. About 20% of our surgeries required >1 trial to remove the stents. It is likely that these multiple inserts of the tube would do harm to the urethra, which increases the possibility of discomfort. We believe that with increasing experience, the stents will be more likely to be removed in a single attempt by pediatric urologists.

5. Conclusions

This novel alternative technique of removing retained ureteral stents lessens operation time, postoperative urination discomfort, and hospital stay. Furthermore, it cuts down risks and expenses

by doing away with cystoscopy. The new procedure provides a feasible, safe, and affordable method to remove retained ureteral stents.

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