

# A simple method for conservative treatment of urinary fistula following ileal conduit

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## Research article

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# Abstract

Background Urinary fistula after ileal conduit is challenging, and this study is to investigate the role of intra-conduit negative pressure system (NPS) in urinary fistula following ileal conduit (IC) as conservative treatment. Methods Using intra-conduit NPS, a minor drainage was set in the silicon tube to suck urine from the conduit with consistent negative pressure. Patients with urinary fistula following IC from August 2012 to July 2017 were recorded, the clinical characteristics and outcome were retrospectively analyzed. Results Intra-conduit NPS was set as a primarily conservative treatment for 13 patients, who suffered urinary fistula presenting as overdose of abdominal/pelvic drainage, without other significant morbidities. Median age was 60 years old (42-74 years), and 7 were male. The median duration between IC operation and urine fistula was 15 days (2-28 days) and the elevated creatinine was detected in abdominal/pelvic drainage with a median level of 2114 $\mu$ mol/L (636-3852 $\mu$ mol/L). Significant decrease of abdominal/pelvic drainage was identified in 12 patients. The median time of NPS is 9 days (7-11days). The other one failed after observing 2 days without any improvement and then underwent open surgery. With ureter stenting, 2 abdominal drainages and intra-conduit NPS set during operation, no urine leaked in the abdominal/pelvic field and the patient cured in 9 days. With median follow-up of 22 months, no fistula recurrence or hydronephrosis was detected. Conclusion Intra-conduit negative pressure system is a feasible and promising way to cure urinary fistula following ileal conduit. For its mini-invasive and simple, it might be an alteration for selected patients.

## Background

Cystectomy and urinary diversion is one of the most complicated procedure in urological operations with nearly 40% of perioperative morbidity. Urinary fistula after ileal conduit is rare, but the management of this complication is challenging [1-4]. Though ureteroenteric anastomosis and closure of conduit are both in risk of urine leakage, the management was almost similar as below: evaluate to ensure the urinary fistula, drainage the urine out, and then repair the fistula actively or conservatively [4-8]. Compared to surgical approaches, retrograde placement of stent and nephrostomy were the most common mini-invasive approaches to deal with urinary fistula following ileal conduit [8-11]. However, the urine cannot be drainage out completely, and sometimes balloon has been used to obstruct ureter during nephrostomy. Though the completeness is favorable in recent studies, it is a complicated mini-invasion procedure in clinical practice.

Negative pressure system (NPS) drainage has been used to cure complicated wound generally [12-14]. In sparse reports, it also revealed a promising outcome for the management of urinary fistula [15-17]. So we tried to use intra-conduit NPS as a conservative way to cure patients who suffered urine leak after ileal conduit since 2012. Initially, NPS was only recommended for patients with good performance as an alternation of retrograde stenting or nephrostomy. Now we report our preliminary experiences of using intra-conduit NPS to deal with urinary fistula after ileal conduit.

## Methods

Patients underwent ileal conduit in our center were retrospectively retrieved from August 2012 to July 2017. Urinary leakage was diagnosed by imaging and/or drain creatinine study in abdominal/pelvic drainage. For these patients who were not presenting with significant abdominal infection or other severe morbidities, intra-conduit negative pressure system was set as a conservative treatment for them. If it didn't work in 2 days, following treatments such as retrograde ureter stenting, nephrostomy or open surgery would be performed. Informed consent was confirmed after comprehensive consultation.

Sterile silicon tube (F18) with lateral holes was set in the conduit again for patients who had taken this tube off after the operation, then a mini plastic tube (F12) also with lateral holes tied to negative pressure system was set in the silicon tube ( Figure 1 ). When the negative pressure system work with the pressure of 20-25 cmH<sub>2</sub>O, urine would be drained out continuously and abdominal/pelvic drainage decrease significantly. This process could be accomplished on the bedside and would work for about one week when no urine leakage detected by clinical evaluation: the dose of urine and abdominal drainage, creatinine level of drainage, patients' complaints and etc.

Perioperative clinical features were retrospectively analyzed and the final follow-up was completed in October 2018. Survival status was recorded, and imaging of the upper urinary tract was retrieved during follow-up of primary cancers.

## Results

During these 5 years, 446 cases of ileal conduit completed following radical cystectomy or pelvic exenteration in our center. 18 patients suffered urinary leakage in 30 days after this difficult procedure. Of these patients, 13 were presenting as overdose abdominal/pelvic drainage, decrease urine output from the ileal conduit, without significant severe morbidities. And intra-conduit negative pressure system was chosen as conservative treatment for them at first.

The median age was 60 years old (42-74 years), and 7 were male. The primary diagnosis was bladder cancer in 11 patients. The median interval time between IC and diagnosis of urine fistula was 15 days (2-28 days) and the elevated creatinine was detected in abdominal/pelvic drainage with a median level of 2114 µmol/L (636-3852 µmol/L). When intra-conduit NPS was set as primary treatment, significant decrease of abdominal/pelvic drainage was identified in 12 patients. For these patients, the median time of NPS working is 9 days (7-11 days ), and then the fistula was cured ( Table 1 ).

The other one failed after observing 2 days without any improvement and then underwent open surgery for combining with consistent ileus and suspicious abdominal infection. Preoperative contrast imaging showed a significant leak at the distal conduit. During the re-operation, complicated sticky makes it difficult to repair a 1cm hole linked to left ureterointestinal anastomosis. During this operation, we found that a sticky belt pressed over the distal third of ileal conduit, and the silicon tube for NPS didn't cross this stricture to suck urine out completely. Double ureter stents and 2 abdominal drainages were set, and a

new silicon tube was placed to the end of the ileal conduit. No urine leaked in abdominal/pelvic field and the patient cured in 9 days after the operation.

With a median follow-up of 22 months (16-46 months), 1 patient died of cervical cancer 41 months after NPS treatment. No hydronephrosis was detected, no recurrence of fistula occurred.

## Discussion

Urinary fistula following ileal conduit is rather rare, but it is associated with severe comorbidities such as abdominal infection, ileus, and metabolism. Treatment is challenging especially when it comes following complicated pelvic organ resection and urinary diversion [6,8-9]. For these fragile patients, management of urinary fistula preferred to be as minimally invasive as possible. Surgical approach is usually avoided for postoperative changes and complicated sticky. In recent years, endourology develops several approaches to deal with this complicated consequence: retrograde ureteral approach and percutaneous nephrostomy, but either of these two options is not easy to accomplish [18-21].

In this cohort, most (12/13) urinary fistula following ileal conduit was cured by intra-conduit NPS, which was time-consuming ( 7-11 days ) but extremely simple, safe and mini-invasive. For these selected patients, intra-conduit NPS as conservative treatment was compatible and tolerant for its almost noninvasiveness and bedside process. And it was easy to evaluate the effect of NPS by decreased abdominal/pelvic drainage and its normalizing creatinine level. For the patient failed, we found the ileal conduit was pressed by a sticky belt during operation so that the silicon tube couldn't reach the end of it. This might result that urine couldn't be sucked off successfully and completely. When the silicon tube was placed well during the second operation, the NPS worked efficiently after the operation. Actually, most urine leakage following ileal conduit was from ureteroenteric anastomosis and conduit closure, so drainage urine out of the conduit was critical to cure urine leakage, and intra-conduit NPS might be a good procedure to accomplish this.

In recent years, more and more studies demonstrated that endourology approaches were feasible to deal with upper urinary tract lesions. Olson L and colleagues reported that success rate was about 74% (40/54) during retrograde endourological management of upper urinary tract abnormalities [10]. And antegrade percutaneous flexible endoscopic approach also demonstrated favorable outcomes [11].

In clinical practice, percutaneous nephrostomy is feasible and relatively safe for ureteroenteric anastomosis stricture. However, for patients with urine leakage following ileal conduit, there is often no obstruction of the ureter. Without hydronephrosis, nephrostomy is deemed to be a difficult procedure, and it is not so safe for patients following radical cystectomy/pelvic exenteration and ileal conduit. Retrograde stenting is much safer, but explore of the ureteric anastomosis is time-consuming, mucosa edema of ileal conduit and ureter makes it not easy. Additionally, this process has a potential risk of invasive abdominal infection.

Compared to endourology approaches and transperitoneal surgery, intra-conduit NPS is more mini-invasive and convenient [9, 18]. However, we can't see the details in the conduit during this bedside process, and the place of silicon tube might not be deep enough for some reasons. If it doesn't work, further management such as ureteral stenting and/or nephrostomy, even surgery might be needed. What's more, for 8 patients, the ureter stent wasn't taken off when urinary fistula was diagnosed. So retrograde ureteral stenting might not be so reliable for some patients.

Though there is no recommendation of NPS in the treatment of urinary fistula following ileal conduit, NPS had often been used in complicated wounds, and its uniform negative pressure could enhance wound healing. In some complicated cases with urine leakage, NPS was associated with favorable outcome [15-16]. In this study, intra-conduit NPS also resulted in a favorable outcome as a conservative procedure. So NPS might be a good alternative to cure urinary fistula following ileal conduit. Compared to potential risk and uncertainty of other approaches, intra-conduit NPS is mini-invasive and compatible, caregivers could try it in clinical practice in selected patients.

As a retrospective study, the indications of NPS was not strictly defined, and selection bias was inevitable, for all patients were in good condition when they choose intra-conduit NPS as a conservative treatment for urine leakage. For the rarity of urine leakage, the population was limited and no control group was recorded. As a new approach to treating urine leakage following ileal conduit, advanced study and long-term follow-up were needed. And all of these patients were censored in our single center, a university-affiliated hospital. Meanwhile, these patients could receive good supportive treatment, consistent observation, and evaluation. To our knowledge, this is the largest report of NPS used in urinary fistula. As a conservative treatment, intra-conduit negative pressure system is mini-invasive and compatible for selected patients with urinary leakage following ileal conduit.

## Conclusion

Intra-conduit negative pressure system is a feasible and promising way to cure urinary fistula following ileal conduit. For it's mini-invasive and simple, it might be an alteration for selected patients. Further advanced study is needed.

## List Of Abbreviations:

IC: ileal conduit.

NPS: Negative pressure system.

## Declarations

Ethics approval and consent to participate: This study was approved by the ethics committee of Sun Yat-sen University Cancer Center ( YP2008063 ) . Informed consent was obtained from all individual

participants included in the study. Consent to participate was acquired in written format.

Consent for publication: not applicable.

Availability of data and material: All data generated or analyzed during this study are included in this published article.

Competing interests: The authors declare that they have no competing interests.

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Author's Contribution: ZKQ: Protocol/project development; HTL, LT, KHX: Data collection or management; YLY, HTL, LT: Data analysis; YLY, ZKQ: Manuscript writing. All authors have read and approved the manuscript.

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## References

1. Novara G, Catto JW, Wilson T, et al. Systematic review and cumulative analysis of perioperative outcomes and complications after robot-assisted radical cystectomy. *Eur Urol*. 2015; 67: 376-401.
2. Bochner BH, Dalbagni G, Sjoberg DD, et al. Comparing Open Radical Cystectomy and Robot-assisted Laparoscopic Radical Cystectomy: A Randomized Clinical Trial. *Eur Urol*. 2015; 67: 1042-50.
3. Sathianathan NJ, Kalapara A, Frydenberg M, et al. Robotic Assisted Radical Cystectomy vs Open Radical Cystectomy: Systematic Review and Meta-Analysis. *J Urol*. 2019. doi: 10.1016/j.juro.2018.10.006.
4. Lee RK, Abol-Enein H, Artibani W, et al. Urinary diversion after radical cystectomy for bladder cancer: options, patient selection, and outcomes. *BJU Int* 2014; 113: 11-23.
5. Gill HS. Diagnosis and Surgical Management of Uroenteric Fistula. *Surg Clin North Am*. 2016; 96: 583-92.
6. Kuetting D, Pieper CC. Percutaneous Treatment Options of Lower Urinary Tract Fistulas and Leakages. *Rofo*. 2018; 190: 692-700.
7. Brown KG, Koh CE, Vasilaras A, Eisinger D, Solomon MJ. Clinical algorithms for the diagnosis and management of urological leaks following pelvic exenteration. *Eur J Surg Oncol*. 2014; 40: 775-81.
8. Smith ZL, Johnson SC, Golan S, McGinnis JR, Steinberg GD, Smith ND. Fistulous Complications following Radical Cystectomy for Bladder Cancer: Analysis of a Large Modern Cohort. *J Urol*. 2018; 199: 663-8.

9. Msezane L, Reynolds WS, Mhapsekar R, Gerber G, Steinberg G. Open surgical repair of ureteral strictures and fistulas following radical cystectomy and urinary diversion. *J Urol.* 2008; 179: 1428-31.
10. Olson L, Satherley H, Cleaveland P, et al. Retrograde endourological management of upper urinary tract abnormalities in patients with Ileal Conduit urinary diversion: A dual-center experience. *J Endourol.* 2017; 31: 841-6.
11. Stuurman RE, Al-Qahtani SM, Cornu JN, Traxer O. Antegrade percutaneous flexible endoscopic approach for the management of urinary diversion-associated complications. *J Endourol.* 2013;27: 1330-4.
12. Montori G, Allievi N, Coccolini F, et al. Negative Pressure Wound Therapy versus modified Barker Vacuum Pack as temporary abdominal closure technique for Open Abdomen management: a four-year experience. *BMC Surg.* 2017; 17(1): 86.
13. Driver VR, Eckert KA, Carter MJ, French MA. Cost-effectiveness of negative pressure wound therapy in patients with many comorbidities and severe wounds of various etiology. *Wound Repair Regen.* 2016; 24:1041-1058.
14. Glass GE, Murphy GF, Esmaeili A, Lai LM, Nanchahal J. Systematic review of molecular mechanism of action of negative-pressure wound therapy. *Br J Surg.* 2014; 101: 1627-36.
15. Yetisir F, Salman AE, Aygar M, Yaylak F, Aksoy M, Yalcin A. Management of fistula of ileal conduit in open abdomen by intra-conduit negative pressure system. *Int J Surg Case Rep.* 2014; 5: 385-8.
16. Freeman JJ, Storto DL, Berry-Caban CS. Repair of a vesicocutaneous fistula using negative-pressure wound therapy and urinary diversion via a nephrostomy tube. *J Wound Ostomy Continence Nurs.* 2013 ; 40: 536-8.
17. Heap S, Mehra S, Tavakoli A, Augustine T, Riad H, Pararajasingam R. Negative pressure wound therapy used to heal complex urinary fistula wounds following renal transplantation into an ileal conduit. *Am J Transplant.* 2010; 10: 2370-3.
18. Asvadi NH, Arellano RS. Transrenal Antegrade Ureteral Occlusion: Clinical Assessment of Indications, Technique and Outcomes. *J Urol.* 2015; 194: 1428-32.
19. Natarajan V, Boucher NR, Meiring P, Spencer P, Parys BT, Oakley NE; Stent (Society for Endourology in North Trent) Group. Ureteric embolization: an alternative treatment strategy for urinary fistulae complicating advanced pelvic malignancy. *BJU Int.* 2007; 99: 147-9.
20. Horenblas S, Kroger R, van Boven E, Meinhardt W, Newling DW. Use of balloon catheters for ureteral occlusion in urinary leakage. *Eur Urol.* 2000; 38: 613-7.

21. Forde JC, O'Connor KM, Fanning DM, Guiney MJ, Lynch TH. Management of a persistent ileo-ureteric anastomotic leak with bilateral ureteric occlusion using angioplasty balloon catheters. *Can J Urol.* 2010; 17: 5397-400.

## Tables

Table 1 Clinical characteristics of patients underwent intra-conduit negative pressure system

No.	Age (year)	Primary cancer	Major operation	Interval (day)*	Status of Ureter stent	Time of NPS (day)	Outcome
1	<60	Epithelioid trophoblastic tumor of the uterine	Pelvic exenteration	21	Kept	9	Cured
2	<60	Cervical cancer	Pelvic exenteration	28	Moved	10	Cured
3	<60	Bladder Cancer	Radical cystectomy	2	Kept	7	Cured
4	<60	Bladder Cancer	Radical cystectomy	3	Kept	7	Cured
5	<60	Bladder Cancer	Radical cystectomy	15	Kept	9	Cured
6	>60	Bladder Cancer	Radical cystectomy	24	Moved	10	Cured
7	>60	Bladder Cancer	Radical cystectomy	8	Kept	9	Cured
8	>60	Bladder Cancer	Radical cystectomy	3	Kept	7	Cured
9	<60	Bladder Cancer	Radical cystectomy	14	Kept	9	Cured
10	>60	Bladder Cancer	Radical cystectomy	18	Moved	10	Cured
11	>60	Bladder Cancer	Radical cystectomy	17	Moved	10	Cured
12	>60	Bladder Cancer	Radical cystectomy	15	Moved	2	Failed**
13	>60	Bladder Cancer	Radical cystectomy	4	Kept	11	Cured

NPS: Negative pressure system.

\*Time between fistula and surgery.

\*\*Transformed to surgical approach.

## Figures

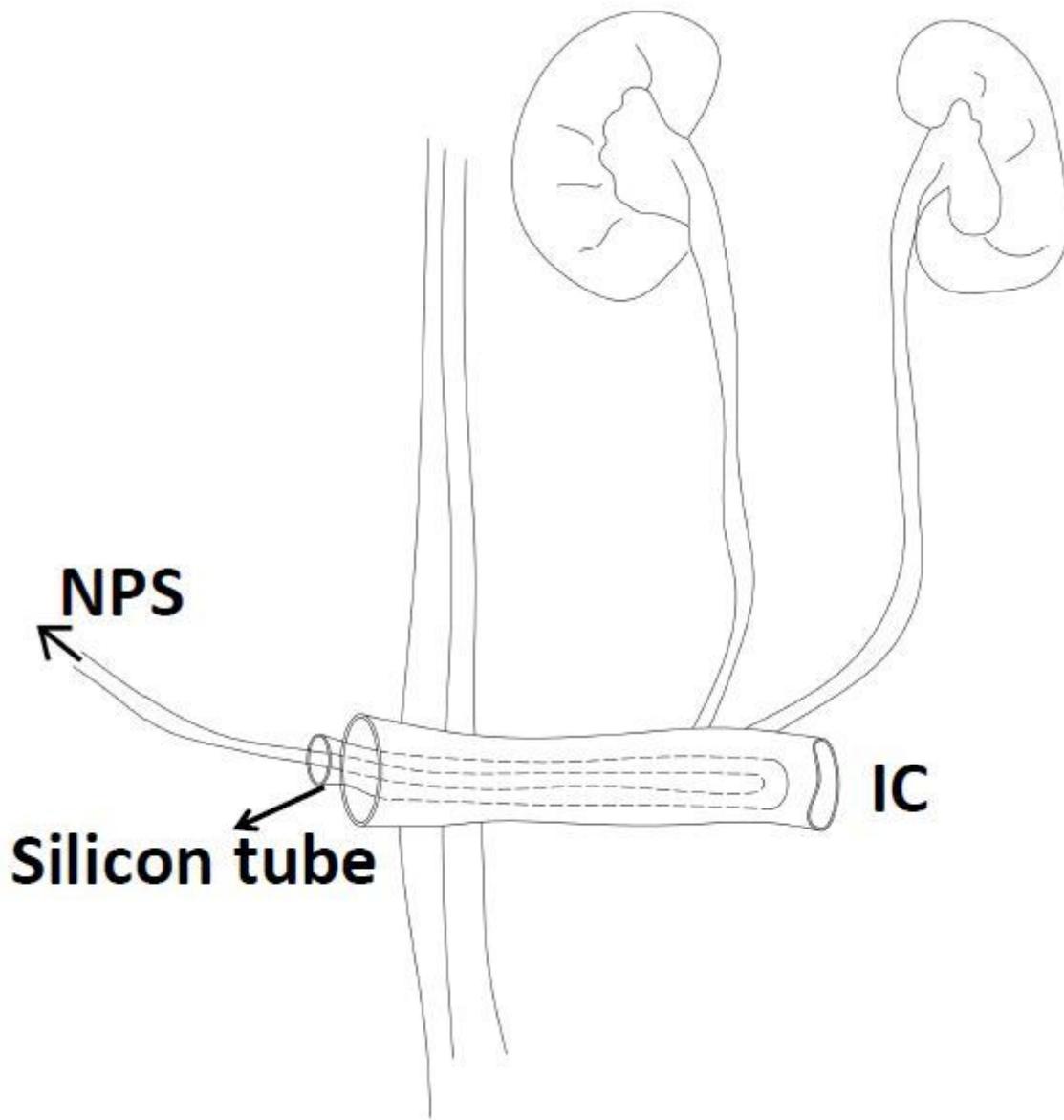


Figure 1

Sketch of the intra-conduit negative pressure system NPS: negative pressure system; IC: ileal conduit.