
Does the Addition of Extra Inflow From a Suprapubic Catheter Improve Continuous Bladder Irrigation Through a 3-Way Transurethral Catheter?

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ABSTRACT

INTRODUCTION: Continuous bladder irrigation (CBI) is often used to help manage hematuria and might be optimized by adding suprapubic inflow to increase urethral outflow. The objective of the present investigation was to develop an experimental model that would reliably measure urethral outflow through a 3-way transurethral catheter (UC) with and without the addition of suprapubic inflow using a variety of suprapubic catheters (SC) of different size combinations (Bard).

METHODS: A 1 L intravenous bag (Hospira, Inc.; Lake Forest, IL) was modified by inserting a 3-way UC into its outflow spigot and a 2-way SC into the front of the bag. The urethral outflows for each size of UC were measured in various combinations of 18F, 20F, 22F, and 24F 3-way UC with and without added inflows from 12F, 14F, and 16F 2-way SC. Water was used as the irrigant for both the urethral and suprapubic catheters and was drained by gravity from 3 L bags from a height of 140 cm. Urethral outflow was measured with a Dantec Urodyn 1000 uroflowmeter. Each run was done 5 times using outflows of at least 150 cc over at least 75 seconds. Means were compared by paired *t* test.

RESULTS: Three-way 18F, 20F, and 22F UC showed no significant or minimal improvement in outflows by adding 12F, 14F, or 16F suprapubic inflows. None of these 3-way catheters were able to handle the extra inflow from a 16F suprapubic catheter and the "bladder" became overly distended (OD). Three-way 24F UC showed maximal improvement in outflow when combined with 14F or 16F suprapubic inflows; OD was not a problem.

CONCLUSION: Additional inflow from a 14F or 16F SC will maximally increase urethral outflow by at least 3.6 cc/second only when combined with a 24F 3-way UC.

KEY WORDS: Continuous bladder irrigation; Transurethral catheter; Suprapubic catheter; Three-way catheter; Hematuria.

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INTRODUCTION

Despite the best efforts of medical professionals, some patients develop urinary tract bleeding associated with recurrent clot retention that is not easily controlled. Initial management includes evacuation of clots, fulguration of bleeding sites, insertion of a larger 3-way transurethral catheter, beginning continuous bladder irrigation (CBI) with or without chilled irrigant, and traction on the catheter [1] plus correction of abnormal bleeding parameters. Typically, the bleeding follows a transurethral resection of the prostate (TURP) or retropubic prostatectomy and fortunately is uncommon. When the bleeding cannot be controlled endoscopically, some urologists try to optimize the CBI by adding suprapubic inflow to increase urethral outflow in order to reduce clotting in the bladder. There is no other literature available which addresses this topic.

The objective of the present investigation was to develop an experimental model that would reliably measure urethral outflow through a 3-way irrigating transurethral catheter, with and without the addition of suprapubic inflow. The authors used a variety of catheters of different size combinations (Bard) in order to determine the optimal suprapubic and transurethral catheter combination that would maximize the CBI.

METHODS

An empty 1 L intravenous bag (Hospira, Inc; Lake Forest, IL) was modified by inserting a 3-way transurethral catheter into its outflow spigot and a 2-way suprapubic catheter into the midportion of the front of the bag; different bags were used for each test. Thirty cc were placed in the balloon of each 3-way catheter and 5 cc in the balloon of each 2-way catheter. The urethral outflows were measured for each of various combinations of 18F, 20F, 22F, and 24F 3-way transurethral catheters with and without added inflows from 12F, 14F, and 16F 2-way suprapubic catheters. Water was used as the irrigant

for both the transurethral and suprapubic catheters and was drained by gravity from 3 L bags from a height of 140 cm. Transurethral outflow was measured with a Dantec Urolyn 1000 uroflowmeter. Each run was done 5 times using outflows of at least 150 cc over at least 75 seconds and was compared by paired *t* test.

RESULTS

Table 1 shows the mean outflow in cc/second from the 3-way transurethral catheter with its inflow alone and with the addition of suprapubic catheter inflow for a variety of catheter size combinations. Combinations that were significantly different at $P \leq .01$ are indicated on the table with an asterisk. Three-way 18F, 20F, and 22F catheters were unable to handle the extra inflow from a 16F suprapubic catheter and the "bladder" became over distended (OD). Therefore, when using a 3-way 24F outflow catheter, the statistically significant gains of 3.6 and 5.9 cc/second with the 14F and 16F inflow catheters, respectively, were considered the best results for clinical application.

DISCUSSION

Bladder irrigation is a procedure in which sterile fluid is used to prevent clot retention by continuously irrigating the bladder via a 3-way transurethral catheter. It is used typically in the early postoperative period following TURP. Infrequently, the bleeding from small vessels and open venous sinuses can be problematic and not controlled by simple CBI. This may require a return visit to the operating room for definitive evacuation of clots and fulguration of bleeding areas. Use of a transurethral catheter with a greater cross-sectional port [2] with or without chilled irrigant and/or catheter traction may help but, uncommonly, the bleeding continues to be problematic. It is in this circumstance that the addition of suprapubic inflow placed via a percutaneously-placed catheter may be used to maximize

Table 1. Comparison of CBI Outflows (cc/s) Using Different Sizes of 3-Way Urethral Catheters Without and With the Addition of Suprapubic Inflow Using Different 2-Way Catheters.

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3-way outflow catheter size	2-way 12F inflow			2-way 14F inflow			2-way 16F inflow		
	Without	With	Difference	Without	With	Difference	Without	With	Difference
18F	1.7	1.7	0	1.9	1.9	0	2.9	4.9	2
20F	3.2	3.6	0.4	2.9	4.1	1.2*	4.1	5.0	0.9
22F	3.3	4.2	0.9*	3.6	5.0	1.4*	5.0	5.8	0.8
24F	5.6	5.8	0.2	2.7	6.3	3.6*	3.1	9.0	5.9*

*Difference statistically significant ($P \leq .01$)

outflow and reduce clotting within the bladder.

The results of the current study show that a 14F or 16F suprapubic catheter will maximally increase urethral outflow by at least 3.6 cc/second only when combined with a 24F 3-way transurethral catheter. The results may be different in the human experience due to vagaries of bladder compliance, particulate matter in the urine, and hematuria with clots.

It is not recommended that a suprapubic catheter be inserted when there is evidence of urothelial malignancy because of the risk of tumor seeding. In other circumstances, it provides a safe and effective means of optimizing CBI when the appropriate-sized catheters are used.

CONCLUSION

Additional inflow from a 14F or 16F SC will maximally increase urethral outflow by at least 3.6 cc/second only when combined with a 24F 3-way UC. This has the potential to offer urologists a new and specific means of reducing problematic clotting in the bladder.

Conflict of Interest: none declared

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