

Urinary tract infection control in intensive care patients

Yan Liu, MM, Dong Xiao, MM*, Xiao-hui Shi, MM

Abstract

This retrospective study tried to find the potential approach for reducing the urinary tract infection (UTI) in intensive care patients (ICPs) among adult population.

In total, 96 eligible ICP cases were included. Of these, 48 cases received 10% povidone-iodine and were assigned to the intervention group, while the other 48 cases underwent sterile water, and were assigned to the control group for the prevention of catheter-associated UTI before indwelling urinary catheter insertion in ICP. The primary outcome was the occurrence of an UTI after the indwelling catheter. The secondary outcome was the identification of pathogenic species. The outcomes were assessed after catheter removed.

After catheter removal, the occurrence of an UTI did not differ significantly between the 2 groups ($P = .34$). In addition, no significant differences regarding the pathogenic species were detected between the 2 groups (*Escherichia coli*, $P = .73$; *Candida albicans*, $P = .57$; *Enterococcus*, $P = .65$; *Proteus mirabilis*, $P = .50$; *Citrobacter*, $P = .50$; *Klebsiella pneumoniae*, $P = .57$).

The use of 10% povidone-iodine may not help reducing UTI in ICP.

Abbreviations: CDC = Centers for Disease Control and Prevention, ICP = intensive care patients, ICU = intensive care unit, UTI = urinary tract infection.

Keywords: effectiveness, intensive care patients, urinary tract infection

1. Introduction

Urinary tract infection (UTI) is one of the most common complications in intensive care patients (ICPs).^[1–3] It has been reported that this condition accounts for up to 40% of the 2 million hospital-acquired infections each year.^[4,5] Of these, UTI is the most common hospital-acquired infections.^[6–8] Its incidence is reported to vary from 3.1 to 6.4 catheter-associated UTI per 1000 catheter-days.^[9] Furthermore, 60% to 80% of UTI results from the presence of indwelling urinary catheters.^[10,11] Previous study also reported that the risk of UTI increases when the using of catheter increases, for example, 5% daily risk for the development of UTI if a patient has an indwelling urinary catheter.^[12,13]

Under such situation, cleansing the periurethral area thoroughly before applying an indwelling urinary catheter is very important.^[14,15] The US Centers for Disease Control and Prevention (CDC) strongly recommends to use soapy water,

and distilled water or povidone-iodine, for sterilizing the periurethral area before catheter performance.^[16] However, the results of previous studies have been contradictory.^[17,18] Some studies have reported that this approach was not effective in decreasing the UTI rate, while other studies found a significant difference in UTI rate with such approach.^[17,18] Moreover, limited data are still available of such approach for Chinese ICP. Thus, in this retrospective study, we tried to find the potential approach for reducing the UTI in ICP among Chinese adult population.

2. Methods

2.1. Design

This retrospective study included 96 eligible ICP cases. Of these, the 48 cases in the intervention group received 10% povidone-iodine, while the other 48 subjects in the control group underwent sterile water. All outcomes were evaluated after the indwelling urinary catheters removed.

The study was conducted at Xinjiang Uygur Autonomous Region People's Hospital from between December 2015 and August 2017. It was approved by the Medical Ethical Committee of The People's Hospital of Xinjiang Uygur Autonomous Region. All included cases provided informed written consent. All cases were selected from the intensive care unit (ICU) department at The People's Hospital of Xinjiang Uygur Autonomous Region.

2.2. Inclusion and exclusion criteria

Patient cases were included if they had an indwelling urinary catheter more than 48 hours in place during the period of their stay in the ICU. All patients were aged between 31 and 78 years. However, cases were excluded if they did not have an indwelling urinary catheter or stayed in the ICU less than 5 days. In addition,

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The authors declare that they have no competing interests.

Department of Critical Care Medicine, Xinjiang Uygur Autonomous Region People's Hospital, Urumqi, China.

* Correspondence: Dong Xiao, Department of Critical Care Medicine, Xinjiang Uygur Autonomous Region People's Hospital, No. 91 Tianchi Road, Urumqi 830000, China (e-mail: Dongxiao201804@yeah.net).

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the cases were also excluded if they had insufficient information of all characteristic values and outcome data.

2.3. Intervention

All patients in both groups were cleaned with soap and water at the periurethral area initially. In addition, patients in the intervention group were further cleaned with 10% povidone-iodine solution. Patients in the control group were further cleaned with sterile water. After that, all patients were cleansed with sterile water-saturated sterile pads before the indwelling urinary catheter.

2.4. Outcome measurements

The primary outcome was measured by the occurrence of an UTI after the indwelling catheter.^[19] The secondary outcome was measured by the identification of pathogenic species.^[20] The urine culture was collected on the first day of admission to the ICU. Then, it was operated every 3 days until the indwelling catheter was removed. Urine culture was performed by the microbiological laboratory. The outcomes were measured and assessed after catheter removed.

2.5. Statistical analysis

All data were analyzed by using SPSS software (SPSS V.19.0; IBM Corp., Armonk, NY). Of these, *t* test was applied to analyze the normally distributed continuous data, while Mann-Whitney *U*-test was utilized for non-normally distributed data. In additionally, χ^2 test was used to analyze the categorical data. A statistical significance was defined as $P < .05$.

3. Results

The characteristics of all patient cases are listed in Table 1. No significant differences regarding all demographic and clinical variables differed between 2 groups in this retrospective study.

Table 1
Patient characteristics.

Characteristics	Intervention group (n = 48)	Control group (n = 48)	P
Age, y	69.5 (12.1)	67.8 (13.3)	.51
Gender			
Male	29 (60.4)	25 (52.1)	.41
Female	19 (39.6)	23 (47.9)	—
Race			
Uyghur ethnicity	38 (79.2)	41 (85.4)	.42
Han ethnicity	10 (20.8)	7 (14.6)	—
Diagnosed diseases			
Respiratory system	20 (41.7)	22 (45.8)	.68
Cardiovascular system	6 (12.5)	3 (6.2)	.30
Neurologic system	18 (37.5)	21 (43.8)	.53
Others	4 (8.3)	2 (4.2)	.41
Previous admission to ICU			
Yes	8 (16.7)	5 (10.4)	.37
No	40 (83.3)	43 (89.5)	—
Reasons of catheter indwelling			
Incontinence	6 (12.5)	7 (14.5)	.77
Surgery	17 (35.4)	20 (41.7)	.53
Decreased mobility	25 (52.1)	21 (43.8)	.41

Data are present as mean \pm standard deviation or number (%).

Table 2

Comparison of primary outcome measurements between 2 groups.

Outcome measurements	Intervention group (n = 48)	Control group (n = 48)	P
Occurrence of an UTI	7 (14.6)	4 (8.3)	.34
Duration of ICU stay, d	18.4 (5.1)	16.9 (4.7)	.13
Duration of catheterization, d	10.2 (3.6)	9.6 (3.3)	.39

Data are present as mean \pm standard deviation or number (%).
ICU = intensive care unit, UTI = urinary tract infection.

After catheter removed, the occurrence of an UTI in the intervention group did not significantly differ with that in the control group ($P = .34$, Table 2). Furthermore, there were not significant differences of the pathogenic species between 2 groups (*Escherichia coli*, $P = .73$; *Candida albicans*, $P = .57$; *Enterococcus*, $P = .65$; *Proteus mirabilis*, $P = .50$; *Citrobacter*, $P = .50$; *Klebsiella pneumoniae*, $P = .57$; Table 3).

4. Discussion

To our best knowledge, there is still insufficient evidence to support that 10% povidone-iodine in ICP that may help to reduce the occurrence of an UTI after catheter indwelling. Although a previous study specifically addressed this study, it explored the effect of 10% povidone-iodine among the pediatric population.^[21] That study tried to assess the efficacy of periurethral cleaning with 10% povidone-iodine, 0.05% chlorhexidine gluconate, and sterile water for the prevention of UTI before the indwelling urinary catheter operation.^[21] Its results did not find significant differences in the reduction of the occurrence of an UTI among 3 inventions before the indwelling urinary catheter insertion.^[21]

In this retrospective study, it investigated the potential approach for reducing the UTI in ICP among adult population. It compared the effect of 10% povidone-iodine with sterile water in preventing catheter-associated UTI before indwelling urinary catheter insertion in ICP among the Chinese adult population.

The results of this retrospective study demonstrated that patients who underwent 10% povidone-iodine did not show better outcomes in the occurrence of an UTI, as well as the pathogenic species, compared with patients who received sterile water in preventing catheter-associated UTI before the indwelling urinary catheter. It indicates that 10% povidone-iodine may be not beneficial for ICP receiving indwelling urinary catheter for the prevention of UTI.

This study suffered from several following limitations. At first, this study was only conducted at 1 center of Xinjiang Uygur Autonomous Region People's Hospital, which may impact the

Table 3

Comparison of urinary tract infection pathogens.

Outcome measurements	Intervention group (n = 48)	Control group (n = 48)	P
<i>Escherichia coli</i>	4 (8.3)	5 (10.4)	.73
<i>Candida albicans</i>	2 (4.2)	1 (2.1)	.57
<i>Enterococcus</i>	3 (6.3)	2 (4.2)	.65
<i>Proteus mirabilis</i>	1 (2.1)	0 (0)	.50
<i>Citrobacter</i>	0 (0)	1 (2.1)	.50
<i>Klebsiella pneumoniae</i>	2 (4.2)	1 (2.1)	.57

Data are present as number (%).

generalizability of our findings to the other centers. Then, the sample size of this study is relatively small, which may affect the results of this study.

Furthermore, the outcome measurements were not comprehensive, because all the available outcome data from this study were only based on the completed patient cases. Finally, the present retrospective study did not involve any procedures of randomization and blinding, which may result in a high risk of case selection.

5. Conclusion

The results of this study showed that the administration of 10% povidone-iodine may not reduce the occurrence of an UTI in ICP during the study period.

Author contributions

Conceptualization: Dong Xiao, Yan Liu, Xiao-hui Shi.

Data curation: Yan Liu, Xiao-hui Shi.

Formal analysis: Xiao-hui Shi.

Investigation: Yan Liu.

Methodology: Yan Liu, Xiao-hui Shi.

Project administration: Dong Xiao.

Resources: Dong Xiao, Yan Liu.

Software: Xiao-hui Shi.

Supervision: Dong Xiao.

Validation: Dong Xiao, Yan Liu.

Visualization: Dong Xiao, Yan Liu.

Writing – original draft: Dong Xiao, Yan Liu, Xiao-hui Shi.

Writing – review & editing: Dong Xiao, Yan Liu, Xiao-hui Shi.

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