

PERIURETHRAL CLEANING SOLUTION AGAINST BACTERIA COLONIZATION COUNT IN THE PERIURETHRAL AREA PRIOR TO URINARY CATHETERIZATION

Cairan Periurethral Cleaning terhadap Jumlah Bakteri di Area Periurethral pada Pasien yang akan dipasang Kateter

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ABSTRAK

Pendahuluan. *Patient safety* merupakan elemen penting yang perlu diperhatikan bagi pelaku pelayanan kesehatan termasuk perawat. Penelitian ini bertujuan untuk menilai efektifitas cairan periuretral *cleaning* terhadap jumlah koloni bakteri di area periurethral pada pasien yang akan dipasang kateter urin. **Metode.** Metode penelitian yang digunakan adalah kuantitatif dengan desain quasi experiment pre dan post intervensi. Sampel terdiri dari 60 responden, masing-masing 20 responden pada kelompok povidone iodine 10%, povidone iodine 2% dan normal saline. **Hasil.** Hasil analisa uji beda dan regresi linear didapatkan secara statistik ada perbedaan yang bermakna terhadap penurunan jumlah rata-rata koloni bakteri pre dan post intervensi pada kelompok povidone iodine 2% dan normal saline (p-value:0,00; <0.05), povidone iodine 10% (p-value:0,55; >0.05). **Diskusi.** Povidone iodine 2% adalah cairan yang paling efektif dalam menurunkan jumlah koloni bakteri pada area periuretral dibandingkan dengan cairan lain. Diperlukan untuk melakukan tes jumlah koloni bakteri pada pemeriksaan kultur urin menggunakan cairan pembersih periuretral tersebut.

Kata kunci : *Periurethral cleaning, patient safety, povidone iodine 10 %, povidone iodine 2 %, normal saline*

ABSTRACT

Introduction: *Patient safety is an important element that must be noted when providing care to patients, including by the nurse. The purpose of this study was to compare the effectiveness of cleaning periurethral with povidone iodine 10 %, povidone iodine 2% and normal saline against bacteria colonization before catheterization. Methods:* This study used a quasi-experimental pre- and post-intervention design with a control group. *Periurethral swabs were obtained from a total of 60 patients (povidone iodine 10 % as a control group, 20; povidone iodine 2%, 20; normal saline, 20). Results:* Through a paired t-test, it can be seen that there was a significant decrease (p-value: 0.00; $p < 0.05$) in the bacteria colonization count using povidone iodine 2% and normal saline. When using povidone iodine 10% , there was no significant decrease (p-value: 0.55; $p > .05$) in the bacterial colonization count. **Discussion:** *Povidone-iodine 2% is the most effective solution for us to reduce bacterial colonization in the periurethral area rather than another solution. The recommendation is to test for bacteria colonization in the urine culture using the different periurethral cleaning solutions.*

Keyword: *periurethral cleaning, patient safety, povidone iodine 2%, povidone iodine 10%, normal saline*

INTRODUCTION

Health professionals provide care in both the clinical and community setting. When providing care, patient safety has become an important element that must be heeded to, especially in Indonesia. Consequently, all procedures that are carried out by health professionals have to be based on the right standard. One of the nursing procedures that commonly happens in the clinical setting is an in-dwelling urinary catheterization. Gray (2004), in Nasiriani et al, (2009) stated that the incidence rate of catheterized patients increased by 25% from the total number of patients hospitalized. This was caused by a

variety of indicators such as urine monitoring, monitoring intake and output, urinary retention, incontinence and the results of other test diagnostics. Therefore, the nurse must understand more about the impacts and risks of urinary catheterization. A one-month observation in a private hospital in Jakarta showed that 63 patients were catheterized with a variety of indications. This procedure can lead to urinary tract infection (UTI), particularly when the nurses are less educated about the principles of the urinary catheterization procedure and periurethral cleaning solution usage. The incidence rate of UTIs will increase, as well as the urethral catheter discharge rate. Consequently, this results in a high medical cost not only for the

patients but also for the hospital (Nasiriani, 2009). UTIs occur and can be caused by the health care provider; 80% of them are related to urinary catheterization (Leaver, 2007).

UTIs can cause kidney problems that lead to an adverse impact on the patients. This condition can be prevented by applying the proper technique and a periurethral cleaning solution. Thus, the health care provider has to consider on safeties of urinary catheterization procedure about prevent the negative effect of procedure and to reduce medical cost burden (Nasiriani, 2009).

Using an antiseptic or periurethral cleaning solution before urinary catheterization is related to the implementation of evidence-based practice. Nasiriani (2009), in their research, compared the use of povidone-iodine 10% and sterile water as periurethral cleaning solutions in relation to urinary catheterization in sixty women to the amount of bacterial colonization in cultured urine. The results of this research showed that there was no significant difference in the amount of colonized bacteria in cultured urine using povidone iodine 10% and a sterile water group. Sixteen percent was best in the povidone-iodine 10% group, while 18% of the positive urine culture was in the sterile water group.

Cheunget al. (2013) obtained 70 urine samples and divided them into two groups. There was the sterile water group and the chlorhexidine 0.05% group. This research result was that there was no significant difference in the amount of colonized bacteria between the two groups. Also, from the two groups, the patients experienced asymptomatic bacteriuria. The prior studies presented that using either povidone-iodine 10% or normal saline before urinary catheterization will not reduce the risk of a UTI significantly. Safety, minimal costs and no side effects were the goals of this study. Periurethral cleaning before urinary catheterization must done by nurses. However, there are still a variety of solutions used by hospitals in Indonesia such as using normal saline and povidone iodine 3%. Most of the hospitals use povidone-iodine 10 %.

Accordingly, the researcher aimed to compare the effectiveness of povidone-iodine 10%, povidone iodine 2% and normal saline by looking at the bacteria colonization count in

the periurethral area before urinary catheterization.

METHODS

This study used a quasi-experimental, pre- and post-intervention design with a control group. The population of this research were adult patients with a variety of indications related to urinary catheterization. The total sample size was 60 patients who had been admitted to the Operation unit in the Emergency Department and to the adult medical-surgical patient department in a private hospital in Jakarta, called Sint Carolus Hospital. Every 20 patients were divided into two groups; the control group for patients who were treated with povidone-iodine 10% and the intervention group for the patients who used povidone-iodine 2% and normal saline. Periurethral swabs were obtained to measure bacteria colonization in the periurethral area before and after cleaning the periurethral area with povidone iodine 10%, povidone iodine 2% and normal saline.

The data was analyzed using a paired t-test and an independent t-test. Simple regression linear was conducted to accomplish the purpose of this study. The confidence level was set at 95%, with a p-value of <0.05.

RESULTS

The majority of the respondents who underwent urinary catheterization were female (37, 61.7 %) with a range of 61 - 88 years of age (26, 43.3%). This study also showed that more than half of the patients did not take antibiotics (31, 51.7%). In this study, the major indication for patients undergoing urinary catheterization was monitoring their intake-output (24, 40%) related to comorbidities such as chronic kidney disease, congestive heart failure, cancer, geriatric problems, and diabetes mellitus.

The respondents in this research were divided into 3 groups; 1 control group and 2 intervention groups. Each group consisted of 20 patients with all of the respondents are 60 patients that have urinary catheterization for the first time arrival.

During the pre-periurethral cleaning procedure using povidone iodine 2%, normal saline, and povidone-iodine 10 solutions showed that the average bacteria colonization

Table 1 Distribution of the Respondents (N=60)

Characteristics	N	%
Age(y/o)		
20-40	18	30.0
41-60	10	16.7
61-80	26	43.3
>80	6	10.0
Gender		
Male	23	38.3
Female	37	61.7
Urinary catheter indication		
Urine retention	16	26.7
Monitoring intake-output	24	40.0
Surgery	20	33.3
Antibiotic consumption		
No	31	51.7
Yes	29	48.3

Table 2 Distribution of the Bacteria Colonization, Pre- and Post-Periurethral Cleaning

Group	Pre		Post		Difference in the	
	<i>periurethralcleaning</i>		<i>periurethralcleaning</i>		bacteria colonization	
	Mean \pm SD	*Min-max	Mean \pm SD	*Min-max	Mean \pm SD	*Min-max
Pov. Iodine 10 %	976 \pm 2497,756	20 - 10000	65,50 \pm 224,041	0 - 1000	910,50 \pm 2475,999	0 - 9830
Pov.iodine 2 %	8585 \pm 23280,895	70 - 100000	1257 \pm 4002,168	0 - 18000	7328 \pm 19424,891	20 - 82000
Normal Saline	4601 \pm 9046,818	50 - 36000	2508 \pm 5804,817	40 - 24000	2093 \pm 5104,307	0 - 23000

*min= minimal bacteria count, max= maximal bacteria count in CFU(Coloni Forming Unit)

was 8585, 4601, 976, respectively. The other results of the current study on post-periurethral cleaning procedures using povidone iodine 2%, normal saline, and povidone-iodine 10 solutions showed that the average amount of bacteria colonization was 1257, 2508 and 65.50, respectively. This means that the lowest amount of bacteria colonization after the periurethral cleaning procedure was shown in the normal saline group.

A difference in the bacterial colonization showed that povidone-iodine 2% was effective at reducing bacterial colonization down to 7328 and povidone iodine 10% was less effect at reducing bacterial colonization, down to 910. Povidone-iodine 10% can cause mucosa irritation in the urethra, which can lead to urinary tract infection.

The current study has presented that the decrease in bacterial colonization before and after periurethral cleaning was found to be significant between povidone iodine 2% and the normal saline group ($p = .00$). However,

bacterial colonization in the povidone-iodine 10% group showed no statistically significant reduction ($p = 0.552$).

This study has presented that all periurethral cleaning solutions (povidone iodine 2%, povidone iodine 10% and normal saline) were effective at reducing bacterial colonization in the peri-urethral area, measured through Levene’s test > 0.005 and $p < 0.005$.

In term of the effectiveness of the periurethral cleaning variable, povidone iodine 2% showed a significant difference in relation to the bacteria colonization count ($\beta = 0.668$, $p = 0.028$), contrary to normal saline that showed no significant differences in the bacterial colonization ($\beta = 0.094$, $p = 0.533$).

DISCUSSION

Wilkinson & Treas (2011) stated that people in a certain age range face a higher risk of disease related to immunity and the aging process. Devarianti (2015) stated that women

Table 3 Comparison - Bacterial Colonization Pre- and Post-Periurethral Cleaning

Group	p value ¹
Povidone iodine 10 %	0.552
Povidone iodine 2 %	0.00
Normal Saline	0.00

¹paired t-test, p value <0.05

Table 4 Comparison - Bacterial Colonization between Groups

Group	Levene's test for equality of variances	Sig.(2-tailed) ¹
Pov.iodine 10% vs Pov.iodine 2 %	0.765	0.000
Pov.iodine 2% vs normal saline	0.532	0.033
Pov.iodine 10% vs normal saline	0.520	0.000

¹t-independent test , sig < .05

Table 5 Periurethral Cleaning Solution that Reduces the Bacterial Colonization Count in the Periurethral Area

Solution	β value	p value
Povidone iodine 2 %	0.668	0.028
Normal saline	0.094	0.533

have a greater chance of experiencing particularly degenerative diseases such as cancer, cardiovascular disease, multiple sclerosis and SLE (systemic lupus erythema) related to aging. Other factors can influence immunity, including hormonal factors and lifestyle.

Aging may lead to bodily system functioning problems. Patients may experience a related effect such as micturition problems. A decrease in the micturition reflex can cause urinary incontinence and retention, and subsequently the patient needs to use a urinary catheter to stimulate urination. Weis et al. (2012) mentioned that urinary tract infection does not decrease significantly - like antibiotic consumption - in a patient undergoing urinary catheterization, with limited evidence supporting this phenomenon nowadays.

Microorganisms live in the human body as normal flora that and participate in maintaining health. Although normal flora are a benefit, they can cause disease if the number of normal flora exceeds the default level and if the body is unhealthy. Scotland recommends normal saline as a periurethral cleaning solution because normal saline is both consistent and valid (National Services Scotland, 2012). Cunha (2013) mentioned that normal saline is effective at the reducing urinary tract infection incidence rate.

The current study presented that the decrease in the bacteria colonization before

and after periurethral cleaning was found to be significant between povidone iodine 2% and normal saline (p=0.00). However, bacterial colonization in the povidone-iodine 10% group showed no statistically significant reduction (p=0.552). This result is contrary to the prior study, which stated that cleaning the periurethral area with sterile water will reduce the colonization of bacteria as measured through a urine culture (Cheung, 2008).

Povidone-iodine is one of the periurethral cleaning solutions that can be used as a disinfectant for the skin and mucous membranes as a part of preoperative preparedness, and as an antiseptic in wound management (Martindale, 2009) due to its acidic nature (pH 1.5-5). Similarly, normal saline has an antimicrobial effect due to its acidic nature (pH 5), which has been proven to reduce bacterial colonization even though that normal saline doesn't involve antimicrobial activity.

This study has presented that using povidone iodine 2% as periurethral cleaning solution before urinary catheterization was effective at reducing bacterial colonization in the periurethral area. This is different to the results of a study that held by Webster et al. (2001), which mentioned that between water sterile and chlorhexidine 0.1%, there were no significant differences when it came to reducing bacteria colonization. Similarly, a study by Nasiriani (2009) mentioned that using

tap water and povidone-iodine to clean the periurethral area in sixty women undergoing gynecologic surgery didn't decrease bacteria colonization after 24 hours of urinary catheterization.

CONCLUSION

The current study indicates that povidone iodine 2% was the most effective cleaning solution to use to reduce bacterial colonization in the periurethral area, followed by normal saline and povidone iodine 10%.

RECOMMENDATION

Povidone-iodine 2% was effective at reducing bacterial colonization in the periurethral area before the urinary catheter procedure began compared to other cleansing solutions. Consequently, the application of povidone-iodine 10% as a peri-urethral cleaning - which is currently commonly used in the clinical setting - needs to be evaluated.

The researcher suggests that future studies should aim to determine the best percentage of povidone-iodine to use as a periurethral cleaning solution in order to gain powerful evidence of the effects of the intervention preventing urinary tract infection by calculating the bacteria colonization count in a urine culture sample.

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