JIDC | THE JOURNAL OF INFECTION IN DEVELOPING COUNTRIES

Brief Original Article

Genital region cleansing wipes: Effects on urine culture contamination

Mehmet Burak Selek, Bayhan Bektöre, Ogün Sezer, Tuğba Kula Atik, Orhan Baylan, Mustafa Özyurt

Department of Microbiology, Gülhane Military Medical Academy, Haydarpaşa Training Hospital, Istanbul, Turkey

Abstract

Introduction: Urine culture is the gold standard test for revealing the microbial agent causing urinary tract infection (UTI). Culture results are affected by sampling techniques; improper sampling leads to contamination of urine and thus contamination of the culture with urogenital flora. We aimed to evaluate the effect of urogenital cleansing, performed with chlorhexidine-containing genital region cleansing wipes (GRCW) on contamination rates.

Methodology: A total of 2,665 patients with UTI-related complaints and with urine culture requests from various outpatient clinics were enrolled in the study. Of the patients, 1,609 in the experimental group used GRCW before sampling, while 1,046 in the control group did not use any wipes.

Results: The contamination rate in the experimental group patients was 7.7%, while it was 15.8% in the control group. Contamination rates were significantly higher in the control group than in the experimental group for both women and men. Contamination rates for children and adults were also significantly lower in the experimental group than in the control group.

Conclusions: Our study, conducted in a large population, showed that the use of chlorhexidine-containing cleansing wipes significantly reduced urine culture contamination rates in both genders, in both child and adult age groups. Using GRCW, collection of urine after urogenital area cleansing will decrease the contamination problem.

Key words: genital region cleansing wipe; urine culture; contamination

J Infect Dev Ctries 2017; 11(1):102-105. doi:10.3855/jidc.8910

(Received 02 June 2016 – Accepted 09 September 2016)

Introduction

Urinary tract infection (UTI) is one of the most common infections among both inpatients at hospitals as well as in the community. About 10% of the human population has had at least one UTI during their lifespan. Urine culture is accepted as the gold standard test for the diagnosis of UTI. In most cases, properly collected midstream urine (MSU) samples, which contain more than 10^5 colonies per milliliter, indicate infection [1-3]. For appropriate treatment of infection, isolates must be identified and antibiotic resistance must be known. However, inappropriate collection of urine samples may cause contamination of a sample with urogenital skin flora. Contamination, may lead to problems during interpretation and reporting of culture results. Even though direct MSU collection is still the most common method, various levels of contamination rates in urine samples have been reported in various studies [4-8]. In cases of contamination, resampling from patients is required. Therefore, contamination reports delay diagnosis, increase laboratory workload, and cause unnecessary antibiotic use and development of resistant pathogens. Repetitive urine cultures increase the total cost of the tests and harm an institution's reliability [9,10].

In this study, patients admitted to outpatient clinics of our tertiary stage hospital and for whom urine cultures were requested were included. The effect of urogenital cleaning with chlorhexidine-containing genital region cleansing wipes (GRCW) on urine culture contamination rates was evaluated. Various methods for decreasing contamination rates have been examined in previous studies [5,6,8,9,11]. However, in our literature search, no study evaluating contamination rates of urine culture after using GRCW was found. Another important aspect of our study is the use of a quite large population, which makes it more reliable.

Methodology

Sample collection

Patients admitted to the pediatrics, urology, emergency, internal medicine, infectious diseases, and obstetrics and gynecology outpatient clinics with UTI complaints between 1 December 2015 and 1 May 2016 were selected. Of these patients, 2,655 for whom urine culture was requested were included to the study. All

patients were asked for MSU sampling according to the instructions, which were given as leaflets prepared by the laboratory (two different leaflets for two groups). Parents of the pediatric patients were informed. A total of 1,609 (60.6%) randomly selected patients (experimental group) used GRCW (Destimal Saglik Kozmetik San. Tic. Ltd. Sti., Istanbul, Turkey) before sampling, and the remaining 1,046 (39.4%) control patients did not use any wipes. They only used soap and water per the instructions given by the laboratory. Patients who had used antibiotics within seven days were not included to the study. A random sampling method was used for choosing experimental and control patients. The GRCWs used in this study were chlorhexidine-containing, cheap, portable, and easy-to-use wet wipes that do not require soap, water, or any other cleaning material. The local ethics committee approved the study design (05 November 2015/41, 1491-119-15/1539), and written informed consent was obtained from patients who participated in this study.

Culture

Collected urine samples were inoculated on 5% sheep's blood agar and eosin-methylene blue agar (Salubris Inc., Istanbul, Turkey); petri dishes were incubated at 37°C for 18–24 hours in aerobic conditions. Reporting of the cultures was performed based on the American Microbiology Society guidelines [12]. Samples were reported as no growth if no colonies were detected on the petri dishes after 18–24 hours [12]. Samples were reported as contaminated if three or more colonies (mixed growth) were detected containing low levels (< 10^4 CFU/mL) of microorganisms found on the skin or urogenital flora. In this case, another sample for culture was requested from the patient. Detection of one or two microorganism species totaling > 10^5 CFU/mL colonies or totaling < 10^5 CFU/mL colonies but with UTI symptoms led to further evaluation. Isolated microorganisms were identified using conventional biochemical tests and they were confirmed using the automated identification system VITEK 2 (BioMerieux, Marcy l'Étoile, France). Lastly, microorganisms were reported along with colony counts and antibiotic resistance results.

Statistical analyses

All data were analyzed using SPSS 16.0 (Statistical Package for Social Sciences) for Windows (IBM, Armonk, USA). Contamination rates were calculated using Pearson's Chi-squared test for statistical analysis, and the decrease in contamination was calculated using a logistic regression test. $P < 0.05$ were accepted as statistically significant.

Results

In this study, 2,655 patients admitted to the pediatrics, urology, emergency, internal medicine, infectious diseases, and obstetrics and gynecology outpatient clinics were included. Of these patients, 71.6% (n = 1,901) were women, while 28.4% (n = 754) were men; 17.5% (n = 465) were children between 5 and 14 years of age, while 82.5% (n = 2,190) were adults over 15 years of age.

There was significant difference (p = 0.0001) (Table 1) in contamination rates between the experimental group of patients who used GRCW (7.7%, n = 124) and the control patients (15.8%, n = 165). GRCW use decreased the contamination rate 2.243 times (p = 0.0001; odds ratio = 2,243; confidence interval = 1.751–2.872).

Table 1. Change of contamination rate between the groups that used (n = 1,609) and did not use (n = 1,046) genital area cleaning wipes based on gender and age.

		General (n = 2,655)		Gender				Age			
				Male (n = 754, 28.4%)		Female (n = 1,901, 71.6%)		Children (5–14 years) (n = 465, 17.5%)		Adults (15 or above) (n = 2,190, 82.5%)	
		GRCW use		GRCW use		GRCW use		GRCW use		GRCW use	
		Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Contamination	(+)	124 (7.7%)	165 (15.8%)	19 (4.6%)	40 (11.8%)	105 (8.8%)	125 (17.7%)	27 (8.7%)	22 (14%)	97 (7.5%)	143 (16.1%)
	(-)	1,485 (92.3%)	881 (84.2%)	397 (93.4%)	298 (88.2%)	1,088 (91.2%)	583 (82.3%)	283 (91.3%)	133 (85.8%)	1,202 (92.5%)	748 (83.6%)
Total		1609 (60.6%)	1046 (39.4%)	416 (55.2%)	338 (44.8%)	1193 (62.8%)	708 (37.2%)	310 (66.7%)	155 (33.3%)	1,299 (59.3%)	891 (40.7%)
p		0.0001		0.0001		0.0001		0.03		0.0001	

GRCW: genital region cleansing wipes.

Contamination rates were 8.8% (n = 105) for female and 4.6% (n = 19) for male patients in the experimental group and 17.7% (n = 125) for female and 11.8% (n = 40) for male patients in the control group (Table 1). Contamination rates for both male and female patients were significantly higher in the control group than in the experimental group (p = 0.0001).

A total of 465 children between 5 and 14 years of age were included in the study. Contamination rates were significantly lower (p = 0.03) among children in the experimental group (8.7%, n = 27) than in the control group (14.2%, n = 22). Contamination rates were also significantly different among 2,190 adult patients (p = 0.0001): 7.5% (n = 97) for adults in the experimental group and 16.1% (n = 143) in the control group (Table 1).

Discussion

UTIs emerge after pathogenic microorganisms affect urinary system organs such as the urethra, bladder, kidney, or prostate. Detection of > 10^5 CFU/mL growth indicates infection in a properly collected MSU sample. Urine may become contaminated with skin or distal urethral flora in both genders. There is an additional contamination risk for women with perineal and vaginal flora [3]. Various definitions have been used for urine culture contamination by researchers [5,6,8,9,11].

In our study, urine culture contamination was defined as contamination of urine sample with growth of microorganisms < 10^4 CFU/mL of the skin or urogenital flora or mixed growth of three or more microorganism species. Changing levels of contamination have been demonstrated in various studies [5,8,11,13]. Reported variances among these studies may be attributed to the contamination definition, sample collection, and transport methods, as well as differences in study populations.

Valenstein *et al*. [7] reported a contamination rate of 20.6% in women and 9.5% in men. However, Shrestha *et al.* [9] reported contamination rates of 12.7% in women and 2.8% in men. These differences between genders, which have also been confirmed in our study in both groups, may be caused by the anatomical and hormonal differences among male and female urogenital systems. Saez-Llorens *et al*. [5] and Lohr *et al*. [14] compared the MSU sampling techniques in children in their studies. However, both of these studies failed to demonstrate the effect of washing the genital area on reducing contamination rates.

Vaillancourt *et al*. [15] showed a significant decrease of contamination rates of MSU samples collected from children who used wipes and liquid soap. MacDonald *et al*. [6] found that chlorhexidine decreased contamination rates in 62 sick babies between 1 and 24 months of age, but found that the use of chlorhexidine was not cost effective. In another study, Baerheim *et al*. [8] investigated perineal area cleaning with 111 healthy women between 19 and 40 years of age. Opening the labia to prevent contact with urine during sample collection decreased contamination significantly, while cleaning the perineal area with wipes humidified only with water had no effect on decreasing contamination risk. Jackson *et al.* [4] showed that the use of a urine collection device decreased contamination rates in a study conducted on 2,182 female patients. In another study, Lifshitz *et al*. [16] reported no significant decrease in 242 female outpatients who used cleaning wipes containing benzalkonium before MSU collection.

In our study, contamination rates were found to be significantly decreased in the experimental group compared to the control group among children. The results were also similar in adults. These data clearly show that cleaning the urogenital area, especially with GRCW containing chlorhexidine, decreases contamination rates in urine culture.

In the present study, indications for sampling urine seem to be a weakness of the study; however, this condition is valid for both study groups, and the presence of randomization eliminates this limitation.

No study was found in our literature search that used GRCW to decrease contamination rates. Moreover, our study was performed on a large population, while the other studies targeted limited groups.

Conclusions

Contamination of urine culture is a common problem in routine bacteriology laboratory practice. Even though patients were notified verbally about how to collect urine samples and given leaflets prepared by our laboratory showing instructions for MSU collection, the collection of the MSU samples by the patients was still questionable. Contamination of urine culture increases total test costs due to repetitive cultures, loss of patient confidence in healthcare institutions, unnecessary prescription of antibiotics, and increase in drug-resistant pathogens. Data acquired from our study, which is focused on the contamination rates of urine culture of a large patient population, clearly demonstrates the applicability, efficiency, and

acceptability of the method. Collection of MSU after urogenital area cleansing will decrease the contamination problem, which is a major issue of urine cultures. Further cost analysis studies can demonstrate the economic profit provided from the elimination of unnecessary culture repeats and antibiotic use.

References

1. Stamm WE, Norrby SR (2001) Urinary tract infections: Disease panorama and challenges. J Infect Dis 183 Suppl 1: 1-4.
2. Gibly RL (1998) Infections of the urinary tract and male genitalia. In Brillman JC, Quenzer RW, editors. Infectious Disease in Emergency Medicine. Philadelphia: Lippincott-Raven. 601-629.
3. Stamm WE (2005) Urinary tract infection and pyelonephritis. In: Kasper DL, Braunwald E, Hauser S, Longo D, Jameson JL, Fauci AS, editors. Harrison's Principle of Internal Medicine, 16th edition. New York: McGraw-Hill. 1715-1721.
4. Jackson SR, Dryden M, Gillett P, Kearney P, Weatherall R (2005) A novel midstream urine-collection device reduces contamination rates in urine cultures amongst women. BJU Int 96: 360-364.
5. Saez-Llorens X, Umana MA, Odio CM, Lohr JA (1989) Bacterial contamination rates for non-clean-catch and clean-catch midstream urine collections in uncircumcised boys. J Pediatr 114: 93-95.
6. MacDonald NE, Collison S, Wolfish N, McLaine PN, Mackenzie AM (1985) Efficacy of chlorhexadine cleansing in reducing contamination of bagged urine specimens. Can Med Assoc J 133: 1211-1213.
7. Valenstein P, Meier F (1998) Urine culture contamination, a collage of american pathologist Q-Probes study of contaminated urine culture in 906 institutions. Arch Pathol Lab Med 122: 123-129.
8. Baerheim A, Digranes A, Hunskaar S (1992) Evaluation of urine sampling technique; bacterial contamination of samples from women students. Br J Gen Pract 42: 241-243.
9. Shrestha R, Gyawali N, Gurung R, Amatya R, Bhattacharya SK (2013) Effect of urogenital cleaning with paper soap on bacterial contamination rate while collecting midstream urine specimens. J Lab Physicians 5: 17-20.
10. Yaylı G, Ekin Ç, Gülen H (2001) The cost analysis of contamination of bacteriological cultures. Klimik Derg 14: 154-158. [Article in Turkish].
11. Lohr JA, Donowitz LG, Dudley SM (1986) Bacterial contamination rates for non-clean-catch and clean-catch midstream urine collections in boys. J Pediatr 109: 659-660.
12. Pezzlo M, York MK (2007) Urine cultures. In Isenberg HD, Garcia LS, editors. Clinical Microbiology Procedures Handbook, 2nd edition. Washington: ASM Press. 3.12.1-4.
13. Hindman R, Tronic B, Bartlett R (1976) Effect of delay on culture of urine. J Clin Microbiol 4: 102-103.
14. Lohr JA, Donowitz LG, Dudley SM (1989) Bacterial contamination rates in voided urine collections in girls. J Pediatr 114: 91-93.
15. Vaillancourt S, McGillvray D, Zhang X, Kramer MS (2007) To clean or not to clean: Effect on contamination rates in midstream urine collections in toilet-trained children. Pediatrics 119: 1288-1293.
16. Lifshitz E, Kramer L (2000) Outpatient urine culture: does collection technique matter? Arch Intern Med 160: 2537-2540.

Corresponding author

Mehmet Burak Selek,
Department of Medical Microbiology Gülhane Military Medical Academy, Haydarpaşa Training Hospital, Tıbbiye street, 34668 Üsküdar, Istanbul, Turkey
Phone: +90 2165422020
Fax: +90 2165422020
Email: mbselek@gata.edu.tr

Conflict of interests: No conflict of interests is declared.