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# THE EFFECTIVENESS OF NETILMICIN SULPHATE INSTILATION ON THE URETHRA CATHETER REMOVAL PROCEDURE IN REDUCING THE INCIDENCE OF CATHETER ASSOCIATED URINARY TRACT INFECTION

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**Objective:** Catheter associated urinary tract infection (CAUTI) is the most common complication of short-term indwelling catheters. The risk of this complication is increase along with the length of catheter insertion. There is no complete agreement of intravenous administration of prophylaxis antibiotic in reducing the incidence of CAUTI. Currently, antibiotic instilation into bladder was developed, however it is still a controversial issue. Therefore in this study we would like to see the effectiveness of this procedure in reducing the risk of CAUTI. **Method**: Single blind randomized controle trial was conducted on 40 eligible male patients treated at surgical ward, Sanglah Hospital between March and August 2012. Twenty patients had netilmicin sulfate instilation and anathor 20 patients treated without instilation procedure. Urine culture was taken before and after catheter removal. The number of colonies were analyzed according to the WHO criteria. In this study WHO critirion 3 was used with a significant bacteriuria of more 10 5 CFU / mL. Data were analyzed with Chi-square table and processed statistically with SPSS. Significance was set at p value <0.05 with 95% CI. **Results**: The mean age was 50.07 (SD 15.49) years. The avarage length of urinary catheterization was 5 days (range from 4 to 14 days). CAUTI was observed in 18 patients (45%); symptomatic was 11 patients (61.1%) and asymptomatic was 7 patients (38.9%). Statistic analysis showed that netilmicin sulfate insilation significantly reduced the risk of CAUTI (OR 0.028 ; CI 0.004 - 0.172). **Conclusion:** Netilmicin sulfate instilation prior to catheter removal significantly reduced the risk of CAUTI after short-term indwelling catheter.

**Keywords: Netilmicin sulfate instilation, short-term indwelling catheters.**

## INTRODUCTION

Urinary tract infections (UTI) reached 40% of all nosocomial infections and approximately 80% related to the use of catheters and has been reported to be accompanied by a mortality rate of 12.7%.[1-4]

Bacteriuria occurs in 26% of patients with indwelling catheter on day $2^{nd}$ – $10^{th}$ and 24% of them developed catheter associated urinary tract infection/CAUTI.[5] After 30 days of catheter insertion, bacteriuria occurs almost 100% on it.[6] The ratio of bacteriuria in patients with short-term indwelling catheters were 10% per day during catheter insertion.[7,8] When the catheter is removed and if there has been a high likelihood of bacteriuria, the urine culture should be taken 24 hours before removing the catheter.[9] There is no agreement when replacing the use of antibiotic prophylaxis for urinary catheters reduced the incidence of bacteriuria nor UTI symptoms in the short-term use of a catheter by a lack of evidence of effectiveness in using prophylactic.[2,10]

Netilmicin sulfate and other aminoglycoside derivatives were soluble in water and have good activity against enterobacteria and Pseudomonas.[11] The nephrotoxic effects of aminoglycoside when administered intravenously was so often in handling cases of UTI, and the evidence that these groups were not absorbed in the walls of the bladder and lower urinary tract considered to use it via instillation.[12-14]

This study was trying to prove the effectiveness of netilmicin sulfate bladder instillation in reducing the incidence of CAUTI, judging from urine culture before and after catheter removal on surgical patients in Sanglah Hospital, Denpasar, Bali-Indonesia

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## MATERIALS AND METHOD

This study was a single-blind randomized control trial, from March to August 2012, with overall eligible samples were 40 patients, which were treated at the Surgical Ward in Sanglah Hospital, Denpasar, Bali. This trial was approved

by the Regional Ethical Review Board in Indonesia by the Faculty of Medicine Udayana University/Sanglah General Hospital Ethic Commission. All patients recruited gave their informed consent to participate.

Samples were randomly allocated (1:1) into treatment and control group. For treatment group, 20 patients had netilmicin sulfate instillation and 20 other without instillation procedure. Urine cultures were taken before and after catheter removal procedure. The number of colonies was analyzed according to the 3rd WHO criteria with significant bacteriuria more than $10^5$ CFU/mL. Data were analyzed with Chi-square table and processed statistically with SPSS. Significance is determined by the value of $p < 0.05$ and 95% CI.

## RESULTS

Samples that met the inclusion criteria were 40 subjects. All subjects were male with a mean age of 50.07 (SD 15.49) years. The day span urinary catheter insertions were 5 days average, with a minimum span 4 days to a maximum 14 days.

Overall results of the urine culture obtained 24 (60%) the growth of bacteria colonies > $10^5$ CFU/mL, and 12 (30%) the growth of colonies of bacteria <$10^5$ CFU/mL. Most classes of germs found are gram-negative bacteria. Five types of the most germs were E. coli (40%), Stap. aureus (17.5%), Pseudomonas sp. (10%), Klebsiela oxytoca (7.5%) and Stap. epidermidis (5%). According to WHO criteria, the growth of > 10 5 CFU/mL bacteria is UTI and significant bacteriuria in this 3rd Category were CAUTI. Of the total eligible subjects, found CAUTI by 18 (45%) subjects, consisting of symptomatic CAUTI 61.1% and 38.9% were asymptomatic.

These results shows that netilmicin sulfate instillation before the catheter removal was statistically significant ($p < 0.05$) lowerring the risk of significant bacteriuria after indwelling short-term urethral catheter insertion (OR 0.028 95% CI 0.004 to 0.172).

## DISCUSSION

Generally, from 40 samples in this study, after an urine culture done prior to catheter removal, earned 18 (45%) growth of bacterial colonies of more than 100,000 CFU/mL. Hyattsville, MD[15], and Calvin Court[16] gain a 40% incidence of UTI after short-term urethral catheter of all health care centers in the United States, while Getliffe & Newton[17] gain 8% incidence of UTI patients treated on community setting. Striking difference of the two results may be related to different patient care areas, where the number of Healthcare Associated Infection (HAI) CAUTI result is higher than in the community. Abby, et al.[18], reported a 24.83% CAUTI incidence of 13,771 cases of HAI.

In this research found that most types of bacteria is E. coli (40%). These results together with the results of research conducted by Suyasa Sastrodiharjo[19], Stewart and Costerton[20] and Pascale, et al.[21] and Jha, et al.[22] that most germs that cause CAUTI was E. coli (49%). This is related to the pathophysiology of UTI, in which nearly 95% are due to ascending infection, so the germs that cause common enteric like a colony of E. coli.[1,3,15] Meanwhile, research of Sumi, et al.[23] found the most germs that cause CAUTI was Pseudomonas (51%). Differences in results are likely due to the germs that cause CAUTI and sensitivity patterns varying according to patient-care areas where patients are admitted to intensive care is often caused by nosocomial bacteria (Pseudomonas), whereas outpatients are often caused by E. coli.

The reason for choosing an aminoglycoside type such as netilmicin sufate are due to which soluble in water and has good activity against enterobakteria and Pseudomonas.[11] Nephrotoxic side effects when administered intravenously is often an obstacle in dealing with cases of UTI.[12] With netilmicin sulfate instillation then their nefrotocsic effects can be avoided, let alone have proved that aminiglykoside group not absorbed in the bladder wall and the lower urinary tract.[13,14] Antimicrobial resistance against bacteria isolated from urine has been investigated by Ling, et al.[24], who conducted a study of two hospitals in Hong Kong, they get an average of 15.6% netilmicin resistance ($p < 0.01$). It was a pretty support the effectiveness of netilmicin kill the germs which grow from urine cultures such as the results of this study.

This study is similar to Puri, et al.[25] however, they are specifically examined patients in neurology and neurosurgery unit who were treated in intensive care. While this study using surgical patients who were admitted to the general surgical ward. The results apparently achieved prove the same thing that drugs known as aminoglycoside bladder instillation effective to reduce the risk of CAUTI. Netilmicin sulfate instillation at a price of drug IDR 296 thousand, much cheaper than the cost to be paid for each episode of CAUTI. According to research Saint,[26] the costs per episode of CAUTI for U.S. $ 676 which is equivalent to IDR 6 million per patient. Although there are some weaknesses in this study, such as the installation is not in the same indications as well as the condition of the study was not double blinded, however the results of this research have proven the effectiveness of netilmicin sulfate instillation into the bladder on procedure of short term indwelling catheter removal, the procedure is easy to do and cost effective. So it can be recommended for routine procedures in the process of short-term catheters removal in hospitals.

Table 1
Data Summary

| Category | Mean/Median | n | % |
|---|---|---|---|
| 1. Age | 50.07 (SD 15.49) years old | | |
| 2. Duration of catheter insertion | 5 days (4 – 14 days) | | |
| 3. Germs type | | | |
| Negative Gram | | | |
| *Escherechia coli* | | 16 | 40.0 |
| *Enterobacter cloacae* | | 1 | 2.5 |
| *Pseudomonas sp.* | | 4 | 10.0 |
| *Morganella morgagni* | | 1 | 2.5 |
| *Actinobacter baumanii* | | 1 | 2.5 |
| *Klebsiella oxytoca* | | 3 | 7.5 |
| Positive gram | | | |
| *Strep. betahemolitikus* | | 1 | 2.5 |
| *Stap. aureus* | | 7 | 17.5 |
| *Stap. epidermidis* | | 2 | 5.0 |
| *Stap. coagulase* | | 1 | 2.5 |
| No Growth | | 3 | 7.5 |
| 4. Bakteriuria > $10^5$ CFU/mL | | 18 | 45.0 |
| Symptomatic CAUTI | | 11 | 61.1 |
| Asymptomatic CAUTI | | 7 | 38.9 |

Table 2
The Efectivity of Netilmicin sulfate Instillation

| Parameter | | Significan Bakteriuria | | | | *p* | OR | 95% CI |
|---|---|---|---|---|---|---|---|---|
| | | No | | Yes | | | | |
| | | n | % | N | % | | | |
| Netilmicin sulfate instillation | No | 4 | 20 | 16 | 80 | 0.001 | 0.028 | 0.004-0.172 |
| | Yes | 18 | 90 | 2 | 10 | | | |
| Total | | 22 | 55 | 18 | 45 | | | |

**CONCLUSION**

Netilmicin sulfate instilation prior to catheter removal significantly reduced the risk of CAUTI after short-term indwelling catheter.

**REFERENCES**

1. Meares EM, Jr. Current patterns in nosocomial urinary tract infections. Urology. 1991. 37(3):9-12.
2. Niel, et al. Antibiotic policies for short-term catheter bladder drainage in adults. Cochrane database of systematic reviews (Online) 2005. (3):CD005428.
3. Bryan CS, Reynolds KL. Hospital-acquired bacteremic urinary tract infection: epidemiology and outcome. J Urol 1984. 132(3):494-8.
4. Anon. Surveillance of hospital acquired bacteraemia in English hospitals 1997-1999. London: Public Health Laboratory Service (PHLS), 2000. 1-11.
5. Saint, S., Wiese, J., Amory, J. K., Bernstein, M. L., Patel, U. D., Zemencuk, J. K., et al. Are physicians aware of which of their patients have indwelling urinary catheters? American Journal of Medicine. 2000. 109(6): 476-480.
6. Parker, D., Callan, L., Harwood, J., Thompson, D., Webb, M. L., Wilde, M., et al. Catheter-associated urinary tract infection. Fact sheet.

Journal of Wound, Ostomy and Continence Nursing. 2009. 36(2): 156-159.
7. Carol J. B. et al. Antimicrobial Prophylaxis Recomendation: Removal of external urinary catheter. American Urological Association Education and Research, Inc. 2007. 15
8. Pfefferkorn U, Lea S, Moldenhauer J, et al. Department of Surgery, St Claraspital, Basel, Switzerland. Antibiotic prophylaxis at urinary catheter removal prevents urinary tract infections. Annals of Surgery. 2009. 249:573–575.
9. Tissot et al. Cost-effectiveness of urinary dipsticks to screen asymptomatic catheter-associated urinary infections in an intensive care unit. Intensive Care Med. 2001. 27:1842-1847
10. NICE (National Institute for Health and Clinical Excellence). Infection Control: clinical guideline 02: available at http://www.nice.org.uk 2008.
11. Grabe, et al. Guidelines on Urological Infections. European Association of Urology 2011. 108-9.
12. Turnidge. Pharmacodynamics and dosing of aminoglycosides. Infect Dis Clin N Am. 2003. 17: 513
13. Chamberlain G, Needham O. The absorption of antibiotics from the bladder. J Urol. 1976. 116:172-3.
14. Kozminski, et al. Intravesical instillation of gentamicin sulfate: In vitro, rat, canine, and human studies. Urology. 1994. 43(4): 531-536.
15. Hyattsville, MD. National Center for Health Statistics, Centers for Disease Control and Prevention, US Department of Health and Human Services (USDHHS): Urinary tract infections in adults. U.S. Government Printing Office. 2004. 13(157).
16. Calvin MK. Catheter-Associated Urinary Tract Infections: A Syllogism Compounded by a Questionable Dichotomy. Clinical Infectious Diseases (CID); 2009. 48:1189–90.
17. Getliffe, K., & Newton, T. Catheter-associated urinary tract infection in primary and community health care. Age and Ageing. 2006. 35(5): 477-481.
18. Abby Weand et al. REPORT: Healthcare-Associated Infections (HAI) in Pennsylvania Hospitals. Pennsylvania Depatement of Health. 2009. 37-38.
19. Suyasa IK, Sastrodiharjo B. Pola Kuman pada Beberapa Kasus Urologi yang Dirawat di Lab/SMF Ilmu Bedah FK UNUD/RS Sanglah Denpasar. Dibacakan pada PIT-IKABI XI, Bandung. 1997.
20. Stewart, P. S., & J. W. Costerton. Antibiotic resistance of bacteria in biofilms. Lancet. 2001. 358:135–138.
21. Pascale S. et al. Enterococcal Biofilm Formation and Virulence in an Optimized Murine Model of Foreign Body-Associated Urinary Tract Infections. Infection and Immunity. 2010. 78(10): 4166–4175.
22. Jha N, et al. A study sensitivity and resistance of pathogenic microorganisms causing UTI in Kathmandu valley. Kathmandu Univ Med J. 2005. 3: 123-9.
23. Sumi Zacharias, et al. A comparative study to assess the effect of amikacin sulfate bladder wash on catheter-associated urinary tract infection in neurosurgical patients. Departement of Neurosurgery. All India Institute Medical Sciences.2009. 7-9.
24. Ling et al., Urinary tract infections in two hospitals in Hong Kong. J Hong Kong Med Assoc. 1992. 44-2, 97-101
25. Puri J, et al. Catheter associated urinary tract infection in neurology and neurosurgical units. J Infect; 2002. 44: 171-5.
26. Saint S. Clinical and economic consequences of nosocomial catheter-related bacteriuria. Am J Infect Control. 2000. 28:68-75