

## Effect of clean intermittent self-catheterization on urinary tract infection in subject with spinal cord injury

Maria Regina Rachmawati\*, Suleiman Sutanto\*, and Rosiana P Wirawan\*\*

### ABSTRACT

\*Department of Anatomy,  
Medical Faculty,  
Trisakti University  
\*\*Rehabilitation Medicine  
Unit, Fatmawati General  
Hospital, Jakarta

#### Correspondence

Dr. Maria Regina Rachmawati,  
Sp.RM  
Department of Anatomy  
Medical Faculty  
Trisakti University  
Jl. Kyai Tapa No.260, Grogol  
Jakarta 11440  
Telp. 5672731 ext.2101  
Email:rachmawati@trisakti.ac.id

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Patients with spinal cord injury are often unable to empty their bladders sufficiently. If this condition is left untreated, urinary tract infection (UTI) is unavoidable, with potentially lethal consequences. The objective of this study was to evaluate the effect of clean intermittent self-catheterization (CIC) on urinary tract infection in subject with spinal cord injury. A randomized controlled design was conducted in subjects who lived at two dormitories were included in this study. They were randomized to clean intermittent self-catheterization or control group. All the subjects were followed for one months. Primary outcome measure was symptomatic urinary tract infection as diagnosed by, pyuria (leukocytes of 100,000 or more per high power field.). Twenty-six patients between 22 to 62 years with cervical spinal cord injuries and urine residue more than 50 cc were recruited. Of the 26 subjects, 18 (69.2%) developed urinary tract infection. The incidence rate of UTI in the CIC group was 5/13 (38.5%); significantly lower than the control group 11/13 (84.6%) ( $p=0.016$ ). Clean intermittent self catheterization in patient with spinal cord injury decreased the risk of developing urinary tract infection.

**Keywords :** Spinal cord injury, clean intermittent self-catheterization, urinary tract infection

### INTRODUCTION

One of the most problematic consequences of a spinal cord injury (SCI) is alterations in lower urinary tract function. Although mortality related to urological complications has been reduced during the last decades, urinary tract

problems continue to be a prominent cause of morbidity after SCI.<sup>(1)</sup> Urinary tract infection (UTI) is a very common complication in persons with SCI.<sup>(2,3)</sup> After SCI, subjects may not feel the urge to urinate when their bladder is full. They also may not have a voluntary control of their bladder and sphincter muscles.

This condition was named neurogenic bladder.<sup>(4)</sup> Patients with neurogenic bladder dysfunction are often unable to empty their bladders sufficiently. If this condition is left untreated, UTI is unavoidable, with potentially lethal consequences. The use of indwelling urinary catheters makes it possible to empty the bladder, but the risk for complicating UTI is still high. Following the introduction of intermittent catheterization with sterile technique, the prognosis for these patients improved.<sup>(5)</sup>

Several studies indicated that clean intermittent catheterization (CIC) is a safe and effective means of managing neurogenic bladder dysfunction and to decrease the risk for renal complications.<sup>(6,7)</sup> Nowadays CIC is widely accepted as the first line in management of patients with neurogenic bladder dysfunction and unbalanced voiding. So far, various urethral catheters have been introduced to the markets.<sup>(8)</sup> Disposable catheters either with self-lubrication or in connection with jelly injected into the urethra, are used to minimize urethral trauma and infection. They increase ease of use during catheterization.<sup>(9)</sup> Clean intermittent self-catheterization (CISC) has proven to be a most satisfying form of bladder drainage as stated by many authors.<sup>(10)</sup>

A randomized controlled trials suggest that CIC technique does not jeopardize patient health, but this studies are limited by small sample size, heterogeneous groups, and inconsistent measures of symptomatic UTI.<sup>(11)</sup> The purpose of this study was to evaluate the effect of CIC on UTI in patients with chronic SCI.

## METHODS

### Research design

An experimental controlled parallel group study was performed from January to March 2007.

### Research subjects

A total of 37 subjects 22 years and older who lived at two disabled dormitories, had chronic SCI and agreed to participate were enrolled. Subjects were included if they had no urinary tract symptom (fever) and had urinary residue more than 50 cc. Exclusion criteria was using pharmacologic agent within the previous 3 months. Subjects gave written informed consent for their participation.

### Catheterization

Subjects were randomized into two groups: group 1, subjects under CIC and group 2, were controls. As preparation CIC group were trained how to do CIC using Python catheter. They were instructed to do the CIC once a day for one month. The two groups were informed about urinary tract complication as a consequence of neurogenic bladder.

### Laboratory analysis

The primary outcome was the incidence of UTI. A UTI is defined as a leukocytes in urine of 100,000 or more per high power field.<sup>(12)</sup> Urinary analysis was done at base-line and one month after CIC intervention.

### Measurement

Urine residue was measured using ultrasound sonography (USG). Levels of injuries were classified according to the American Spinal Injury Association (ASIA) Classification, as ASIA A, B, C, or D.<sup>(13)</sup> ASIA A = complete: no motor or sensory function is preserved in the sacral segments S4-S5; B = incomplete: sensory but not motor function is preserved below the neurological level and includes the sacral segments S4-S5; C = incomplete : motor function is preserved below the neurological level, and more than half of key muscles below the neurological level have a muscle grade less than 3; D = incomplete : motor function is preserved

below the neurological level and at least half of key muscles below the neurological level have a muscle of grade 3 or more; E = normal: motor and sensory function are normal.

**Statistical analysis**

The results were analyzed using chi-square or Fisher’s exact tests to compare categorical variables between the two groups and Student’s t -tests to compare continuous variables.

**RESULTS**

Over 37 potential subjects with cervical, thoracic or lumbar injuries were approached. Reasons for non-participation included using indwelling catheter (1 subject) and rest urine < 50 ml (10 subjects). The final sample was 26 subjects between 22 to 62 years, 13 as the CIC group and 13 as control group (Figure 1).

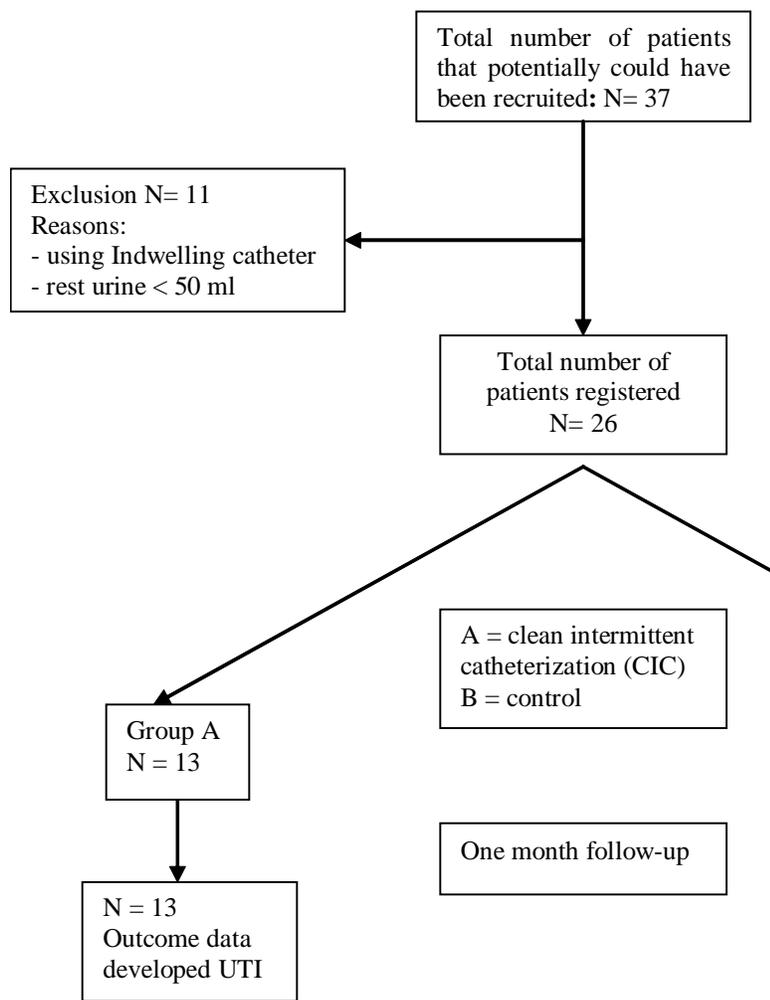


Figure 1. Flow diagram for clean intermittent catheterization study in patients with spinal cord injury

Table 1. The baseline patient characteristics in the CIC § and control groups

Characteristics	CIC (n= 13)
Age (years)	40.7 ± 10.8
Gender	
Male	9 (69.2)
Female	4 (30.8)
Onset of injury (years)	18.7 ± 6.5
Level of SCI*	
C5-C7	0
T1-T12	8
L1-L5	5
Completeness of lesion **	
ASIA A (complete)	8
ASIA B (incomplete)	4
ASIA C (incomplete)	1
Urinary residue	
50 – 100 cc	2
100 – 500 cc	10
≥ 500 cc	1
Urinary tract infections	8

\* SCI : spinal cord injury; \*\* ASIA : American Spinal Cord Injury Association ; §CIC : clean intermittent catheterization

Group 1 was composed of 13 patients (nine males and four females), mean age 40.7 years, and mean disease duration 18.7 years. Group 2 was made of 13 patients (11 males and two females), mean age 41.6 years, and mean disease duration 15.5 years. The clinical features of the two groups are described in Table 1. Spinal cord injuries ranged from C5 to C8, T1 to T12 and L1-L5. Causes included hitting a moose on an isolated highway, falling asleep at the wheel and vehicle rollover, falling from a height at work, and spinal cord tumor. Data concerning completeness and level of the lesion were available from 26 subjects. In total, 19 (73.1%)

had a complete lesion, and 7 (26.9%) an incomplete lesion.

After one month, of the 26 subjects, 15 (57.7%) developed UTI. The incidence rate of UTI in the CIC group was 4/13 (30.8%); significantly lower than the control group 11/13 (84.6%) (p=0.016). (Table 2)

Spinal cord injuries ranged from C5-C7 to L1-L5 with a T1-T12 injury being the most common (61.5%). Among subjects whose spinal cord injuries ranged from T1-T12 to L1-L5, the incidence rate of UTI in the CIC group (30.8%) was significantly lower compared to the control group (91.7%) (p= 0.016). (Table 3)

Table 2. Incidence of urinary tract infections after one month intervention in the CIC and control groups

Urinary tract infections	CIC (n-13)
Positive	4
Negative	9

Table 3. Incidence of urinary tract infection after one month intervention in the CIC and control groups in patients injury T7-T12 and L1-L5

Urinary tract infections	CIC (n=11)
Yes	5
No	6

## DISCUSSION

In this study there was a clear on outcome measure of UTI (the presence of leukocytes in urine of 100,000 or more per  $\geq$ 10 per high power field). Urinary tract abnormalities are quite common after spinal cord injuries and represent a cause of morbidity and mortality.<sup>(14)</sup> Of the 26 subjects, 15 (57.7%) developed UTI: 4/13 (30.8%) in the CIC group; 11/13 (84.6%) in the control group ( $p=0.016$ ). This result was consistent with others who suggest that CIC in a rehabilitation setting in patient with SCI decreased the risk of UTI.<sup>(15,16)</sup> Three randomized controlled trials ranging from 1992 to 1997 were found similar results that CIC in an institutional setting decreased the risk of UTI.<sup>(17-19)</sup> Our data also confirms the main role of CIC for the prevention of UTI. Another study in Italy showed that CIC would prevent the vesicoureteral reflux and urinary tract abnormalities in SCI patients.<sup>(20)</sup> CISC has proved to be a most satisfying form of bladder drainage. It is a useful solution to the major problems of neuropathic bladder dysfunction.<sup>(21)</sup>

What is the best method of intermittent catheterization in patients with bladder dysfunction? In the hospital setting, strict sterile technique is used by healthcare professionals. This technique is not only a time-consuming method for healthcare providers but also costly.' In the community, patients are instructed to perform intermittent catheterization using a clean technique, which is less time consuming and decreases the cost of intermittent catheterization. People living with a neurogenic

bladder are at risk of UTI, including when intermittent catheterization is the method of bladder management. Consistent teaching methods and modeling of desired behaviors will increase patient and family skill with proper technique and satisfaction. This study has indicated that CIC is a safe and effective means of managing neurogenic bladder dysfunction and to decrease the risk for renal complications.

### Limitations of the study

Recruitment was the major obstacle in achieving a larger sample size and proved extremely challenging in the population under study. Despite subjects having a major disability which we expected would mean a nurse-managed continence protocol, many patients started catheterizing or had a caregiver provide care several developed non-urinary tract infections which required antibiotics.

## CONCLUSION

CIC appears safe and effective for SCI patients with urinary residue more than 50 cc who lived at disabled dormitories. Simplification of the catheterization procedure may enhance the transition from rehabilitation to home.

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