



## Role of Prophylactic Antibiotics in Bladder Management of Paraplegics – A Randomised Controlled Study

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### Abstract

**Introduction:** Traumatic spinal cord injury is not an uncommon disease in the developing world. The most common cause being fall from heights. In spinal cord injured patients both bladder sensation and control are impaired. Urinary tract infections are one among the frequent complications seen in spinal cord injured patients. The primary objective of this study is the role of prophylactic antibiotics in the prevention of significant bacteriuria in spinal cord injured patients with neurogenic bladder who are on intermittent clean catheterization.

**Methodology:** The randomized controlled study included 30 patients who had sustained injury to the thoracic and lumbar spinal cord admitted in the wards of departments of Physical Medicine and Rehabilitation, Orthopaedics and Neuromedicine were potential subjects of the study. Microscopical examination and culture of urine samples of all the 30 patients were done at the end of first, third and sixth months. The data obtained was subjected to statistical analysis using appropriate statistical method – SPSS.

**Results:** Thirty patients enrolled in this study were analyzed & compared with existing studies in the literature. 18 patients put in the intervention group & 12 patients put in the control group. This study has shown that 61.11% of the patients sustained injury due to fall from height. 55.56% of the patients were treated with surgical fixation procedures like Steffee plate fixation showing that surgical intervention is commonly undertaken in these patients. This study has shown that administering prophylactic antibiotics along with catheter care and intake of oral fluids significantly reduced bacteriuria in these patients at the end of first, third and sixth months of follow up.

**Conclusion:** Administration of prophylactic antibiotics in spinal cord injured patients with neurogenic bladder on intermittent clean catheterization proved to be effective in the prevention of bacteriuria.

**Keywords:** Spinal cord injury, asymptomatic bacteriuria, urinary tract infection, prophylactic antibiotics, paraplegia.

### Introduction

Traumatic spinal cord injury is not an uncommon disease in the developing world. The most common

cause being fall from heights. It has been described as striking the vibrant, young and active individuals in the community. With improvements in the fields

of medicine and surgery the life expectancy of the patients has increased though a large majority of them are still leading a morbid bedridden life, totally or partially dependant on others for their activities of daily living.

Urinary tract infections are one among the frequent complications seen in spinal cord injured patients<sup>1,2,3</sup>. Normal bladder function is maintained by a normal detrusor muscle of the bladder and internal and external urethral sphincters with intact innervations as well as by supraspinal control mechanisms. Any disruption in this can lead to bladder dysfunction in the form of urinary incontinence or retention. In spinal cord injured patients both bladder sensation and control are impaired. Depending on the extent and level of injury the patients may be either on a continuous drainage of the bladder, on intermittent clean catheterization or on a variety of self voiding techniques like Valsalva's manoeuvre, Crede's manoeuvre and so on<sup>4</sup>. These techniques have risks as well as benefits from a medical standpoint, in addition to affecting the day-to-day lives of spinal cord-injured patients. A catheter free state is the preferred situation to decrease the risk of infection of the urinary tract. Many patients with incomplete lesions return to normal voiding patterns with low residual urine volumes. The lower the residual urine, the lower the chance of urinary tract infection. Intermittent clean catheterization can be initiated and the daily frequency of catheterization is reduced as the voiding improves. When post void residual urine is less than 50 ml, the program can be discontinued. If bacteriuria develops it is treated initially with antibiotics but recurrent asymptomatic bacteriuria is generally not treated to avoid the development of resistant organisms<sup>5</sup>. Symptomatic bacteriuria with fever, leucocytosis, or increased spasticity is treated with proper antibiotics and the catheterization schedule is increased to reduce bacterial concentration and remove the urine that serves as a culture medium for bacterial growth.

Intermittent clean catheterization is employed extensively for neurogenic bladder disease. It requires a low pressure bladder of adequate capacity

(>300ml) and enough outflow resistance to maintain continence with normal daily activities. Patients with lesions at C7 and below can manage self catheterization. A minimum of three catheterizations in 24 hours is recommended, since longer intervals can increase the risk of symptomatic bacteriuria. The most common problems with self catheterization are symptomatic bacteriuria and urethral trauma. Identification of the infecting organism and adequate early initiation of treatment of the infection can help to prevent damage to the urinary tract and preservation of function.

### **Aims & Objectives**

The primary objective of this study is the role of prophylactic antibiotics in the prevention of significant bacteriuria in spinal cord injured patients with neurogenic bladder who are on intermittent clean catheterization.

Secondary objectives are: 1.To identify the most common organism causing urinary tract infection in such patients. 2. To study the sensitivity /resistance pattern of the isolated organism to antibiotic.

### **Materials and Methods**

The randomized controlled study was conducted on 30 patients with Citizens of Kerala who had sustained injury to the thoracic and lumbar spinal cord admitted in the wards of departments of Physical Medicine and Rehabilitation, Orthopaedics and Neuromedicine were potential subjects of the study. About 30 patients who were diagnosed clinically and radiologically to have spinal cord injury were included in the study. The study conducted in the Department of Physical Medicine and Rehabilitation, Medical College, Trivandrum, a tertiary reference center for a Three years period from December 2000 to September 2003.

Inclusion criteria included; 1)Patients with age above 20 years and below 55 years who clinically and radiologically proven spinal cord injury involving the thoracic and lumbar spines were included in the study. 2) Only patients admitted within 18 months of injury with asymptomatic

bacteriuria & had achieved sitting balance were included in the study. Exclusion criteria were Patients with spinal cord injury of the cervical and upper thoracic spines were not included in the study & Patients who were on continuous drainage of the bladder and other self voiding techniques and those who were voiding normally were not included.

### Methodology

Each patient was assessed according to a proforma covering various aspects like age, sex, occupation, income, education, nature of injury, neurological status, complications and functional status. The patients were grouped into an intervention and a control group of 18 and 12 respectively by making use of the randomization table. Microbiological examination of the urine specimen was done initially to assess the presence of polymorphs (pus cells) in urine. A midstream specimen of urine (MSU) was collected by a sterile technique in a sterile container and transported multiplication of possible contaminants. In case of delay the urine sample was stored in a refrigerator at 4<sup>0</sup>c.

Microscopical examination of urine to determine the white cell count and bacteriuria was done at the laboratory by wet film examination of the uncentrifuged urine. A semi- quantitative culture of the urine sample was done by the standard loop technique to determine the infecting pathogenic bacterium and its colony count. Standard loop technique is done by dipping a standard loop vertically into the urine and inoculating onto a CLED agar plate.

Those patients indentified to have significant bacteriuria in the intervention group were given antibiotics for a period of first ten days of every month. They were also advised regarding catheter care and intake of plenty of oral fluids. Those patients under the control group were given only advice regarding catheter care and intake of fluids. No antibiotic was given. Repeat microscopical examination and culture of urine samples of all the 30 patients were done at the end of first, third and sixth months. The data obtained was subjected to

statistical analysis using appropriate statistical method – SPSS.

### Results

Thirty patients enrolled in this study were analysed & compared with existing studies in the literature. 18 patients put in the intervention group & 12 patients put in the control group.

The mean age of the patients in the intervention group was 30.55 years range (20-48 yrs) and in the control group was 30 years range (21-37 years). Patients in the age group 26-35 were slightly more in the intervention group. Of the 18 patients in the intervention group there were 15 males and 3 females 83.3% males and 16.67% females. In the control group there were 10 males and 2 females 83.33% males, 16.67% females.

Of the 18 patients in the intervention group 88.89% of patients were literate and 11.11% were illiterate. In the control group 83.33% of patients were literate and 16.67% were illiterate.

In the intervention group 61.11.% of patients had sustained SCI following fall from height, 22.22% from RTA 16.67% due to other types. In the control group 50% were injured by fall from height and 50% due to RTA shown in table 1- 2. 55.56% of patients had surgical fixation done and 44.44% did not have any surgical intervention. In the control group 66.67% patients had surgical fixation done and 33.33% patients did not have any surgical intervention (Table 3-4).

There was significant reduction in bacteriuria in patients at the end of first, third & sixth months of follow up who were given prophylactic antibiotic along with catheter care. The study was found to be significant ( $p = <0.0005$ ) shown in tables 5-6.

**Table1.** Cause of injury of the patients in the intervention group

Cause of injury	No. of patients (n=18)	Percentage
Fall from height	11	61.11
RTA	4	22.22
Penetrating injury	0	0
Other type	3	16.67

**Table 2.** Cause of injury of the patients in the control group

Cause of injury	No. of patients (n=12)	Percentage
RTA	6	50
Fall from height	6	50
Penetrating injury	0	0
Other type	0	0

**Table 3.** Surgical intervention of the patients in the intervention group

Surgical intervention	No. of patients (n=18)	Percentage
Yes	10	55.56
No	8	44.44

**Table 4.** Surgical intervention of the patients in the control group

Surgical intervention	No. of patients (n=12)	Percentage
Yes	8	66.67
No	4	33.33

**Table 5.** At the end of one month, three months and six months

Colony Count	After 1 month		After 3 months		After 6 months	
	No	Yes	No	Yes	No	Yes
Control	0	12	1	11	1	11
Intervention	14	4	15	3	16	2
Total	14	16	16	14	17	13

**Table 6.** Antibiotic sensitivity

Antibiotics	Colony Count		Total
	No	yes	
Norfloxacin	13	0	13
Cephalosporin	1	1	2
Nitrofurantoin	0	2	2
Co-trimoxazole	0	1	1
Total	14	4	18

**Discussion**

Spinal cord injury with paraplegia is a disabling disease affecting a large proportion of people. A number of complications can arise in such patients due to the immobility arising from the chronicity of their illness and neurological disturbances due to cord damage. One of the most common symptoms these patients experience is urinary symptoms. Immediately after injury, due to acute spinal shock, the bladder will be flaccid. These patients suffer from retention with overflow incontinence. This may last for six weeks after the insult. The spinal cord lesion above the sacral segments interrupts

neural circuits connecting the sacral cord with PMC and other higher centers<sup>6</sup>. The detrusor will be hypertonic and will contract without relaxation of sphincter. These patients suffer from incontinence, retention, frequency and incomplete voiding. Residual urine in the bladder can cause recurrent urinary tract infection and stone formation. Damage to second to fourth sacral spinal segments or the spinal roots result in flaccid areflexia of detrusor without bladder sensations. These patients may suffer from painless urinary retention with overflow incontinence or continuous dribbling. This can lead to myogenic detrusor injury due to over distension and recurrent urinary tract infection. Recurrent infection of the urinary tract can lead to involvement of the upper tract and kidneys and finally result in chronic renal failure and death .

This is a randomized controlled study of 30 patients with spinal cord injury. The study was carried out over a 3 years period. The excessive male preponderance (83.3%) is consistent with other studies of adult onset SCI. The mean age of the study population was 30.55 years. This is slightly more than in the western countries where 50% of the patients are between 15 and 24 years. Age has an inverse bearing on the functional improvement; this is probably because younger patients are more dynamic and active.

In contrast to western studies where road traffic accidents cause more SCI, this study has shown that 61.11% of the patients sustained injury due to fall from height. 55.56% of the patients were treated with surgical fixation procedures like Steffee plate fixation showing that surgical intervention is commonly undertaken in these patients.<sup>7</sup>

This study has shown that administering prophylactic antibiotics along with catheter care and intake of oral fluids significantly reduced bacteriuria in these patients at the end of first, third and sixth months of follow up<sup>5,8,9,10</sup>.

The most common organism identified to cause urinary tract infection in these patients was found to be Klebsiella and the organism was most sensitive to Norfloxacin.

The clinical consequence of urinary tract infection undoubtedly increase health care costs for the affected patients. The economic burden increases as a result of transportation of the patient to the hospital, expenses arising during the hospital stay and for investigation and treatment. There is an additional burden placed on the family in that one more earning member of the family loses his working days and has to stay back along with the patient in the hospital.

The limitations of this study include small sample size, data from the single rehabilitation setting and lack of community based controls

### Conclusion

Administration of prophylactic antibiotics in spinal cord injured patients with neurogenic bladder on intermittent clean catheterization proved to be effective in the prevention of bacteriuria. The most common organism infecting the lower urinary tract was found to be Klebsiella. Norfloxacin was found to be effective in the prevention of urinary tract infection due to Klebsiella.

### References

1. Stover SL ,Lloyd LK , Waites KB , Jackson AB , Urinary tract infection in spinal cord injury. Archives of Physical Medicine and Rehabilitation [01 Jan 1989, 70(1):47-54]
2. GarcíaLeoni ME, Esclarín De Ruz A., Management of urinary tract infection in patients with spinal cord injuries. Clin Microbiol Infect. 2003 Aug;9(8):780-5.
3. Charlesnika T. Evans ), Sherri L. La Vela, Frances M. Weaver , Michael Priebe et al, Epidemiology of Hospital-Acquired Infections in Veterans With Spinal Cord Injury and Disorder, Volume 29, Issue 3, March 2008 , pp. 234-242
4. Paul Abrams, Meena Agarwal, Marcus Drake, et al., A proposed guideline for the urological management of patients with spinal cord injury, Volume 101, Issue 8, April 2008 Pages 989-994

5. G. Roussey-Keslera V. Gadjosc N. Idresd B. HorenoL. Ichaye M.D.Leclair et al. , Antibiotic Prophylaxis for the Prevention of Recurrent Urinary Tract Infection in Children With Low Grade Vesicoureteral Reflux: Results From a Prospective Randomized Study. The Journal of Urology, Volume 179, Issue 2, February 2008, Pages 674-679
6. Paul W. Brazis, Joseph C. Masdeu, and José Biller et al. Localization in Clinical Neurology, 3rd Ed. 1996, chapter 4.
7. La Rosa G1, Conti A, Cardali S, Cacciola F, Tomasello F., Does early decompression improve neurological outcome of spinal cord injured patients? Appraisal of the literature using a meta-analytical approach, Spinal Cord. 2004 Sep;42(9):503-12.
8. Frederic J. Kottke, Justus F Lehmann, Krusen's Handbook of Physical Medicine and Rehabilitation, 4th Ed. March 1990 Chapter 32.
9. Joel A. DeLisa , Bruce Michael Gans, Lynn H. Gerber , Rehabilitation Medicine: Principles and Practice, 3rd Ed. August 1998, Chapter 51.
10. Randall L. Braddom, Physical Medicine/ Rehabilitation, 1st Ed. January 1996, Chapter 55.