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## Bladder Stones in Catheterized Spinal Cord Injured Patients in Nigeria

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## Abstract

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**Objective:** To determine the incidence of bladder stone in patients with spinal cord injury (SCI) and to assess if catheter encrustation and positive urinary culture of *Proteus mirabilis* is predictive of bladder stone.

**Background:** Bladder stones are common urological complication in those with spinal cord injury (SCI) managed with indwelling urinary catheter. Detection and removal of bladder stones are important to prevent possible further complications.

**Design:** Prospective cohort study.

**Methods:** Ultrasound findings in persons with SCI seen from 1<sup>st</sup> January to 31<sup>st</sup> December 2009 who had indwelling urethral catheter at 3 month post injury. Indwelling urethral catheters were examined for encrustation at the time of removal, urine culture taken specifically for *Proteus mirabilis* and ultrasound scan done to detect stone.

**Results:** There were 89 patients with spinal cord injury and 68 patients were evaluated during the review period. Twenty-nine (42.6%) patients had bladder stones and 22 patients had catheter encrustation. Of these 22 patients with catheter encrustation, 18 also had bladder stones. Catheter encrustation had a positive result for bladder stones 81.8% of the time. Forty-six (67.6%) patients had no catheter encrustation. Of these, 7 (14.7%) were found to have bladder stones. Thirty-seven (38.2%) urine cultures were positive for *Proteus mirabilis*. Of these 37 (54.4%) patients, 27 also had bladder stones. Catheter encrustation and positive urine culture of *Proteus mirabilis* in patients with encrusted catheter is highly predictive of the presence of bladder stone.

**Conclusions:** This study suggests that ultrasound scan for presence of stone should be scheduled if catheter encrustation and a positive urine culture of *Proteus mirabilis* are noted

## Introduction

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Spinal cord injury (SCI) in Nigeria is an age long problem.<sup>1-5</sup> Linsenmeyer et al<sup>6</sup> noted the important role of indwelling catheter in the management of spinal cord injured patients. The reason for indwelling catheter in spinal cord injured patients has been attributed to shorten hospital stay of patients, increase cervical injuries and in woman with a high-level injury with adductor spasticity.<sup>6-7</sup>

Indwelling catheter has been implicated in bladder stones formation and is a common urological complication in SCI.<sup>8-10</sup> In tandem with indwelling catheter *Proteus mirabilis* an urease-producing bacterium, by alkanization of urine promotes crystallization of struvite and calcium phosphate leading to stone formation.<sup>11</sup> Bladder stones could cause blockage of catheter leading to bladder distension and consequent autonomic dysreflexia in those with thoracic injuries at T6 level.<sup>6,8</sup>

This study is to determine the incidence of bladder stone in patients with SCI with an indwelling urethral catheter and to assess if catheter encrustation and positive urinary culture of *Proteus mirabilis* is predictive of bladder stone in Nigeria subjects.

## Methods

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The records of patients admitted at the University of Abuja Teaching Hospital, Gwagwalada from 1st January 2009 to 31st December 2009 were prospectively reviewed. All patients with spinal cord injury admitted onto the ward with indwelling urethral catheter and follow up for 3 months were included in this study. Ethical approval was obtained and informed consent given to all the patients recruited into the study.

All the patients in this study had their catheters personally change by the first author. Catheters were examined for crust and catheter tips sent for microscopy, culture and sensitivity. Data extracted include catheter tip culture for *Proteus mirabilis* at 3 month of catheter use, stone crust on the catheter or not and presence or absence of stone on ultrasound scan.

Bladder stone recorded at the first 3 months of indwelling urethral catheter were designated as dependent variables to identify potential risk

associations. Data were analyzed using  $\chi^2$  analysis or Fisher's Exact Test. The predictive measures were determined by crude odds ratios (ORs) and adjusted odds ratios (adjusted ORs). The ORs were adjusted using multi-variate logistic regression; 95% confidence intervals (CI) were used and p-value of  $<0.05$  is significant. Statistical Package for Social Sciences (SPSS) 17.0 was employed for this analysis.

## Results

Sixty-eight spinal cord injured patients with indwelling catheter were enrolled and evaluated in this study at 3 months. There are 29 (42.6%) patients with bladder stones. Catheter encrustation was noted in 22 (32.4%) patients. Of these 22 patients, 19 also had bladder stones. In other words, a positive result for catheter encrustation had a positive result for bladder stones 86.3% of the time. Thirty-six individuals had no catheter encrustation, 3 (4.4%) of these patients were found to have bladder stones. This is depicted in Figure 1.

Figure 2 shows the relationship between positive culture of *Proteus mirabilis* and the presence of bladder stone. *Proteus mirabilis* was cultured in 37 (22.1%) patients. Of these 37 patients, 27 also had bladder stones. A positive result (73.0%) for culture of *Proteus mirabilis* had a positive result for bladder stones. Thirty-one individuals had no positive culture for *Proteus mirabilis*, 2 (4.4%) of these patients were found to have bladder stones. Table 1 shows the association between bladder stone, catheter encrustation and positive culture of *Proteus mirabilis*.

## Discussion

Indwelling catheter is an adjunct in the management of SCI in Nigeria.<sup>1-5</sup> In patients with indwelling catheter bladder stones frequently occur.<sup>6,9,12-13</sup> The catheter stones result from synergism of urinary crystal such as struvite and calcium phosphate and bacteria such as *Proteus mirabilis* facilitated by foreign body like the catheter that alkalinizes the urine and promotes crystallization of struvite and calcium phosphate leading to catheter encrustation.<sup>6,9,12-16</sup> Formation of this small stones set up a cascade leading to more stone formation albeit change in catheter. This stone may block the catheter lumen obstructing urinary flow causing bladder distension.<sup>15-16</sup>

The "gold standard" to detect bladder stones is through the use of cystoscopy.<sup>8</sup> Ultrasound scanning

was however used in this study to detect bladder stone because it is non-invasive, easily available, reproducible and cheap. This is considering that majority of our patients live on less than a dollar a day in Nigeria.<sup>17</sup> Serious risks factor<sup>18</sup> like autonomic dysreflexia or bacteraemia from distension of bladder were not recorded in this study.

This study shows a strong correlation between bladder stone, positive culture for *Proteus mirabilis* and catheter encrustation. In the study by Linsenmeyer et al.<sup>6</sup> they noted an 85% chance that bladder stones are present if there is catheter encrustation. In our study we also noted 86.3% chance despite different modality used to detect the stone. This difference could be due to the large number of subjects in our study compare to that of Linsenmeyer et al.<sup>6</sup>. Also that positive culture for *Proteus mirabilis* provides an excellent correlation with the presence of bladder stones. In this study, if there is positive culture for *Proteus mirabilis*, there is a 73.0% chance that bladder stones are also present. Therefore, if at any time a catheter is noted to be encrusted and there is a positive culture for *Proteus mirabilis*, a patient should be scheduled for ultrasonography to detect stone.

In a small number of patients who had bladder stone and have neither positive culture for *Proteus mirabilis* nor catheter encrustation, ultrasonogram should also be schedule yearly for these patients to detect bladder stone.

## Conclusion(s)

This study suggests that ultrasound scan for presence of stone should be scheduled if catheter encrustation and a positive urine culture of *Proteus mirabilis* are noted.

## Authors Contribution(s)

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## Reference(s)

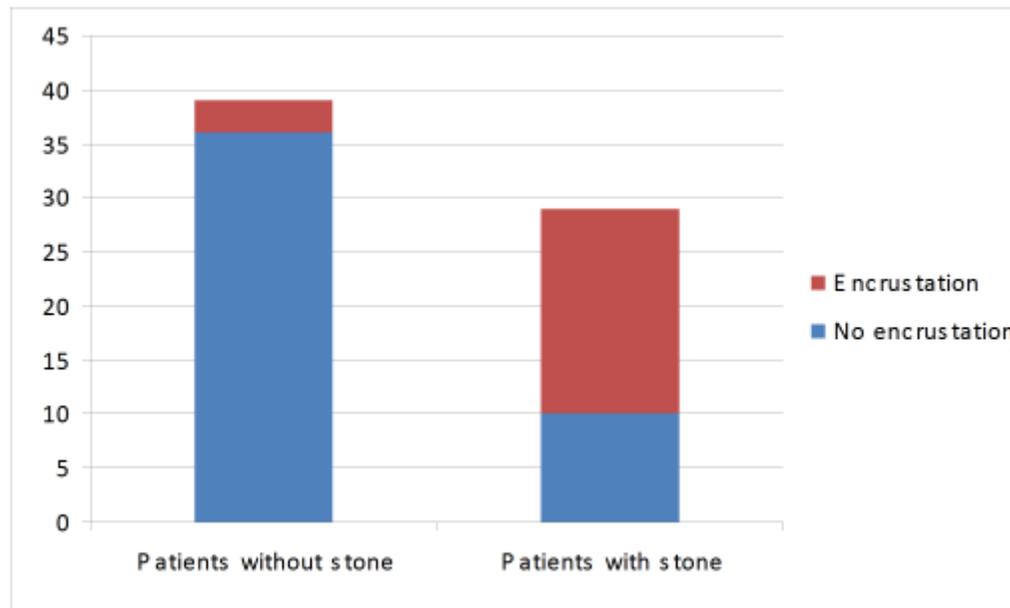
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1. Solagberu BA. Spinal cord injuries in Ilorin, Nigeria. *West Afri J Med* 2002 Jul- Sep; 21(3): 230-2.
2. Obalum DC, Giwa SO, Adekoya-Cole TO, Enweluzo GO. Profile of Spinal injuries in Lagos, Nigeria. *Spinal Cord*. 2008 Aug (cited 2008 Sep 6); Available from: URL: <http://www.ncbi.nlm.nih.gov/sites/entrez>.
3. Olasode BJ, Komolafe IE, Komolafe M, Olasode OA. Traumatic spinal cord injuries in Ile-Ife, Nigeria, and its environs. *Trop Doct*. 2006 Jul; 36(3): 181-2.
4. Umaru H, Ahidjo A. Pattern of spinal cord injury in Maiduguri, North Eastern Nigeria. *Niger J Med*. 2005 Jul-Sep; 14(3): 276-8.
5. Nwadinigwe CU, Iloabuchi TC, Nwabude IA. Traumatic spinal cord injuries (SCI): a study of 104 cases. *Niger J Med*. 2004 Apr- Jun; 13(2): 161-5.
6. Linsenmeyer MA, Linsenmeyer TA. Accuracy of predicting bladder stones based on catheter encrustation in individuals with spinal cord injury. *J Spinal Cord Med* 2006; 24: 402-5
7. Nobunga AI, Go BK, Karunas RB. Recent demographic and injury trends in people served by model spinal cord injury care systems. *Arch Phys Med Rehabil* 1999; 80: 1372-82
8. Linsenmeyer TA, Stone JM, Stein S. Neurogenic bladder and bowel dysfunction. In: DeLisa JA, editor. *Rehabilitation Medicine Principles and Practice*. 4th ed. Philadelphia, PA Lippincott-Raven; 2004. Pp 1619-1653
9. Cardenas D, Farrell-Roberts L, Sipski M, Rubner D. Management of gastrointestinal, genitourinary and sexual function. In: Stower SL, DeLisa JA, editors. *Spinal Cord Injury- Clinical Outcomes from the Model System*. Gaithersburg, MD: Aspen Publication; 1995. pp 120-145.
10. DeVivo MJ, Fine PR, Cutter GR, Maetz HM. The risk of bladder calculi in patients with spinal cord injuries. *Arch Intern Med* 1985; 145: 428-30
11. Mobley HL, Warren JW. Urease-positive bacteriuria and obstruction of long-term urinary catheters. *J Clin Microbiol* 1987; 25: 2216-17
12. Ord J, Lunn D, Reynard J. Bladder management and risk of bladder stone formation in spinal cord injured patients. *J Urol*. 2003; 170: 1734–1737.
13. Favazza T, Midha M, Martin J, Grob BM. Factors influencing bladder stone formation in patients with spinal cord injury. *J Spinal Cord Med*. 2004; 27: 252–254.
14. Linsenmeyer TA, Ottenweller J. Bladder stones following spinal cord injury in the Sprague-Dawley rat. *J Spinal Cord Med*. 2003; 26: 65–68.
15. Hedelin H, Eddeland A, Larsson L, Pettersson S, Ohman S. The composition of catheter encrustations, including the effects of allopurinol treatment. *Br J Urol*. 1984;56:250–254
16. Stamm WE. Catheter-associated urinary tract infections: epidemiology, pathogenesis, and prevention. *Am J Med*. 1991;91: 65S–71S.
17. UNDP. Press release. Nigeria's President Obasanjo applauds UN strategy to end world poverty at Millennium project. (Cited 2010 Jan 19). Available from: URL:<http://undp.org/dpa/pressrelease/2005/march/htm>
18. Binard JE, Persky L, Lockhart JL, Kelley B. Intermittent catheterization the right way! (volume vs time-directed). *J Spinal Cord Med*. 1996;19:194–196

## Illustrations

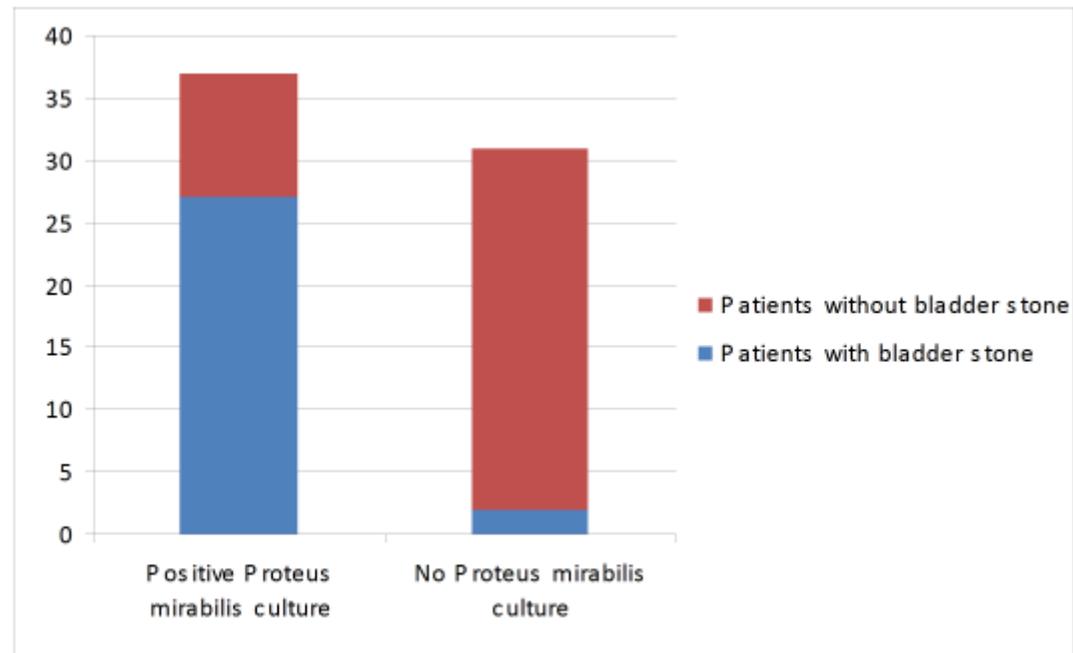
### Illustration 1

Figure 1: Catheter encrustation and presence of bladder stone



## Illustration 2

Figure 2. Proteus mirabilis culture and presence of bladder stone



### Illustration 3

Table 1: Predictors of bladder stone

Parameter	Present	Absent	OR	Adjusted OR	p-Value
Catheter encrustation	18/22(81.8%)	7/46(15.2%)	2.5	2.1 (1.4–3.3)	0.001§
Positive culture for <i>P.mirabilis</i>	27/37(72.9%)	2/31(6.5)	3.3	2.4 (1.7–6.3)	0.001§

Mann-Whitney U test.

*P.mirabilis* - Proteus mirabilis

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