



The impact of bladder management on patient's healthy and health-related quality of life

The term 'spinal cord injury (SCI)' refers to the damage to the spinal cord resulting from trauma or from disease or degeneration. There is no reliable estimate of global prevalence, but the estimated annual global incidence is 40 to 80 cases per million population¹. Available studies show a high male-to-female ratio of 5:1².

In the US, the average age of injury is 30.7, 53 % of patients have tetraplegia, while 46 % have paraplegia³. Most patients with SCI have bladder dysfunction because of their injury, with over 75% unable to voluntarily void⁴.

After acute SCI, spinal shock can last up to 3 months. Autonomic activation of the bladder by the parasympathetic nerves is rendered inactive. The bladder becomes atonic, and there is no conscious awareness of bladder filling. Interruption of the neuraxis below the pons due to SCI eliminates the micturition reflex, which causes urine retention. After the patient is beyond the spinal shock phase, initial urodynamic studies should be performed in order to manage urine retention^{5,6}. To achieve good quality of life, patients with neurogenic bladder should be managed carefully to avoid urinary tract infections (UTI) and damage or destruction of the urinary tract. Urinary tract complications include bladder deformity, vesicoureteric reflux, hydronephrosis and renal failure. UTIs and these urinary complications are closely related to each other⁷. Reducing the incidence of symptomatic UTIs in the acute phase of SCI has a great benefit to the health and rehabilitation of patients. UTIs can result in extended rehabilitation time, missed therapy sessions, and extensive antibiotic treatment⁸.

1 WHO, 2013. <https://www.who.int/news-room/fact-sheets/detail/spinal-cord-injury>

2 Singh A, Tetreault L, Kalsi-Ryan S, Nouri A, Fehlings MG. Global prevalence and incidence of traumatic spinal cord injury. *Clin Epidemiol*. 2014; 23(6): 309-31.

3 Consortium for Spinal Cord Medicine. Bladder management for adults with spinal cord injury: a clinical practice guideline for health-care providers. *J Spinal Cord Med*. 2006; 29(5): 527-73.

4 Cameron AP, Wallner LP, Tate DG, Sarma AV, Rodriguez GM, Clemens JQ. Bladder management after spinal cord injury in the United States 1972 to 2005. *J Urol* 2010; 184: 213-7.

5 Rossier AB, Fam BA, Dibenedetto M, Sarkarati. Urodynamics in spinal shock patients M. *J Urol*. 1979; 122(6): 783-7.

6 Hiersemenzel LP, Curt A, Dietz V. From spinal shock to spasticity: neuronal adaptations to a spinal cord injury. *Neurology*. 2000; 54(8): 1574-82.

7 Matsumoto T, Takahashi K, Manabe N, Iwatsubo E, Kawakami Y. Urinary tract infection in neurogenic bladder. *International Journal of Antimicrobial Agents*. 2021; 17(4), 293-7.

8 Cardenas DD, Moore KN, Dannels-McClure A, Scelza WM, Graves DE, Brooks M, Busch AK. Intermittent Catheterization With a Hydrophilic-Coated Catheter Delays Urinary Tract Infections in Acute Spinal Cord Injury: A Prospective, Randomized, Multicenter Trial. *PM&R*. 2011; 3(5): 408-17.

Conservative management

Conservative management is the most frequently applied treatment option for the neurogenic bladder. Conservative management requires patient education and might include timed voiding, the Valsalva and Credé maneuvers, medications, intermittent catheterization, or an indwelling urinary catheter. Regular bladder emptying with or without anticholinergic medications is important to prevent UTIs, upper tract damage, and incontinence⁹.

The type of bladder management can influence the patient's health and health-related quality of life.

Indwelling catheter

Indwelling catheterization is a method of bladder management in which a catheter is inserted into the bladder and maintained in place for an extended period of time. It can be placed transurethrally or suprapubically.

Indwelling urethral catheters are inserted under sterile conditions, worn continuously, and changed approximately every 4-6 weeks. Size 14-16Fr is generally recommended with 10cc balloons¹⁰.

According to a systematic review of many studies as well as more contemporary data from several other studies, UTI rate is higher with indwelling catheters when compared to intermittent catheterization, with studies showing up to a six-fold rate of UTI in patients with indwelling catheters compared to IC.¹⁰ The daily risk of bacteriuria with indwelling catheterization is 3% to 10%, approaching 100% after 30 days¹¹.

Indwelling urethral catheter drainage is not recommended in SCI patients unless they have difficulty self-catheterizing; for example, in cases of quadriplegia (poor hand dexterity), high intravesical pressure or in the presence of urethral abnormalities.

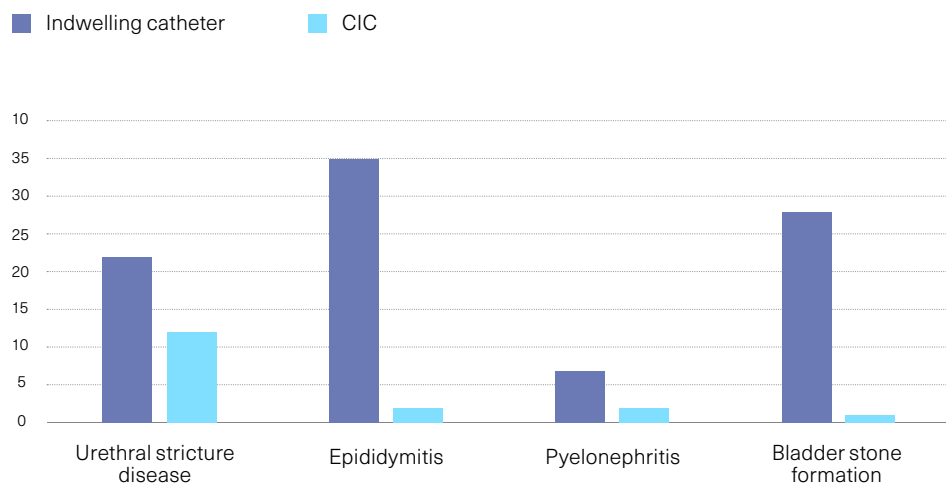
9 Taweel WA, Seyam R. Neurogenic bladder in spinal cord injury patients. *Res Rep Urol*. 2015; 10(7): 85-99.

10 Romo PGB, Smith CP, Cox A, Averbek MA, Dowling C, Beckford C, Cameron AP. Non-surgical urologic management of neurogenic bladder after spinal cord injury. *World J Urol*. 2018; 36(10): 1555-68.

11 Gould CV, Umscheid CA, Agarwal RK, Kuntz G, Pegues DA, Healthcare Infection Control Practices Advisory Committee. Guideline For Prevention Of Catheter-associated Urinary Tract Infections 2009. 2019. <https://www.cdc.gov/infectioncontrol/pdf/guidelines/cauti-guidelines-H.pdf>

An indwelling urethral catheter increases the risks of UTI, renal impairment, bladder stone formation, urethral stricture, urethral erosion, and bladder cancer^{12,13}.

Percentage of patients per management method



*Ration of complications per management method¹⁴

12 Esclarín DA, García LE, Herruzo CR. Epidemiology and risk factors for urinary tract infection in patients with spinal cord injury. *J Urol.* 2000; 164(4): 1285-9.

13 West DA, Cummings JM, Longo WE, Virgo KS, Johnson FE, Parra RO. Role of chronic catheterization in the development of bladder cancer in patients with spinal cord injury. *Urology.* 1999; 53(2): 292-7.

14 Weid KJ, Dmochowski RR. Effect of bladder management on urological complications in spinal cord injured patients. *The journal of urology.* 2000; 163(3): 768-72.

Valsalva and Credé maneuvers

Credé is a method of applying suprapubic pressure to extract urine from the bladder. Valsalva is a method in which an individual uses the abdominal muscles and the diaphragm to empty the bladder. They are generally not recommended as primary methods of bladder emptying. They increase intraabdominal pressure, but they do not ensure complete bladder emptying.[3]

It was noted that patients exhibited residuals exceeding 100 ml, and a half of them exhibited more than 300 ml of residual urine following the manoeuvres. Due to high intraabdominal and intravesical pressure, complications such as developing and/or worsening vesicoureteral reflux, developing and/or worsening hydronephrosis, abdominal bruising, hernia, pelvic organ prolapse, or haemorrhoids are frequent.[3],[9]

Possible complications with Credé and Valsalva

- Incomplete bladder emptying
- High intravesical pressure
- Developing and/or worsening vesicoureteral reflux
- Developing and/or worsening hydronephrosis
- Abdominal bruising
- Possible hernia, pelvic organ prolapse, or hemorrhoids

Clean intermittent catheterization

Intermittent catheterization (IC) is the act of introducing a catheter into the bladder to drain urine via the urethra or other catheterizable channels such as Mitrofanoff continent urinary diversion. The catheter is removed immediately after urine drainage is complete¹⁵.

15 Prieto J, Murphy CL, Moore KN, Fader M. WITHDRAWN: Intermittent catheterisation for long-term bladder management. *Cochrane Database Syst Rev.* 2017; 8(8): CD006008

Traditionally, intermittent catheterization was performed using a sterile technique, which was expensive, time-consuming, inconvenient, and limited outside the hospital. The introduction of a clean technique has facilitated the management of the neurogenic bladder without an increased rate of infections¹⁶. Clean intermittent catheterization (CIC) is now considered the gold standard for managing neurogenic bladder¹⁷. Even though CIC is considered the gold standard in the management of neurogenic bladder and urinary retention management, some complications can occur.

UTIs are the most common complications associated with CIC, constituting a major reason for concern in patients and their clinicians and caregivers¹⁸. A urinary tract infection is the most common cause of cystitis or inflammation of the bladder. Urethral bleeding episodes are common at the onset of CIC, affecting 74% of patients initiating long-term intermittent catheterization, and after 3 months from the onset of CIC, it decreases to 28%, mainly in the male population¹⁹. The trauma of the urethra, especially in men, can cause false passages, meatal stenosis and urethral stricture²⁰.

Conclusion

Before the development of modern methods of neurogenic bladder management, in many cases inadequate treatment resulted in high intravesical pressure, vesicoureteral reflux, and chronic colonization of bacteria and infections, which led to a high rate of complications. The introduction of clean intermittent catheterization has facilitated the management of the neurogenic bladder. Today, clean intermittent catheterization is considered the gold standard for managing neurogenic bladder.

¹⁶ Vapnek JM, Maynard FM, Kim J. A Prospective Randomized Trial of the LoFric Hydrophilic Coated Catheter Versus Conventional Plastic Catheter for Clean Intermittent Catheterization. *J Urol.* 2003; 169(3): 994–8.

¹⁷ Wyndaele JJ and Maes D. Clean intermittent self-catheterization: a 12-year followup. *J Urol.* 1990; 143(5): 906-8.

¹⁸ Schlager TA, Clark M, Anderson S. Effect of a single-use sterile catheter for each void on the frequency of bacteriuria in children with neurogenic bladder on intermittent catheterization for bladder emptying. *Pediatrics.* 2001; 108(4): E71.

¹⁹ Webb RJ, Lawson AL, Neal DE. Clean Intermittent Self-catheterisation in 172 Adults. *British J Urol.* 1990; 65(1): 20–3.

²⁰ Lindehall B, Abrahamsson K, Hjalmas K et al. Complications of clean intermittent catheterization in boys and young males with neurogenic bladder dysfunction. *J Urol* 2004; 172(4 Pt 2): 1686-8.



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