

Original Article

Bladder management in persons with spinal cord lesion

A Dahlberg^{*1}, I Perttilä², E Wuokko² and M Ala-Opas²

¹Käpylä Rehabilitation Centre, Finnish Association of People with Mobility Disabilities, Helsinki, Finland;

²Department of Urology, Helsinki University Hospital, Helsinki, Finland

Study design: Cross-sectional clinical descriptive prevalence study.

Objective: To evaluate the methods of self-reported bladder management, the frequency of urinary tract infection (UTI) and subjective disturbance of bladder problems of all those individuals with traumatic spinal cord lesion (SCL) living in Helsinki area.

Setting: Helsinki, Finland.

Methods: A total of 152 persons with SCL were found in the Helsinki area (546 000 inhabitants). A structured questionnaire was sent to all subjects and they were invited to a clinical visit.

Results: The final study-group consisted of 129 (85%) subjects. They were defined into seven specific subgroups of bladder management: 14 (11%) subjects in the normal voiding group, 15 (12%) in the controlled voiding group, 16 (12%) in the clean intermittent catheterization (CIC) group, 30 (23%) in the mixed group, 31 (24%) in the suprapubic tapping group, 16 (12%) in the compression or straining group and seven (5%) in the catheter or conduit group. The frequency of UTI was highest in the mixed group. The bladder management was a biggest bother to the subjects in the compression or straining group.

Conclusions: This prevalence study assesses the self-reported bladder management methods in all the persons with traumatic SCL in the Helsinki area. The subjects who used CIC and other methods for bladder management had more problems than others. These subjects might manage better by using either CIC or suprapubic tapping as the only method for bladder emptying.

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Introduction

One of the most problematic consequences of a spinal cord lesion (SCL) is alterations in lower urinary tract function. Although mortality related to urological complications has been reduced during the last decades,¹ urinary tract problems continue to be a prominent cause of morbidity after SCL. Urinary tract infection (UTI) is a very common complication in persons with SCL.^{2,3} A neurogenic bladder may lead to pathological changes in the upper urinary tract and finally to renal failure.⁴ Urinary tract-related problems are the most frequent reason for hospital readmissions,^{5,6} and symptoms such as autonomic dysreflexia (AD) and incontinence can cause serious physical disturbances or social inconvenience in the lives of those with SCL. In order to reduce

morbidity and to prevent urological complications, regular contacts with a urological unit are required.

Depending on the level and completeness of the lesion, normal voluntary voiding is usually impossible after SCL. The method of bladder management should be based on urodynamic evaluation and diagnosis of the type of bladder dysfunction.⁷ Clean intermittent catheterization (CIC) is usually the primary recommendation for long-term bladder management.^{8,9} For practical reasons, reflex voiding and Crede or Valsalva methods are still commonly in use, often combined with condom drainage in men. CIC and reflex voiding may be used simultaneously. In addition, indwelling catheter (urethral or suprapubic) remain in common use.¹⁰

Several operative interventions are available to improve bladder function. External sphincterotomy has been used for sphincter–detrusor dyssynergia and enterocystoplasty for augmentation. Invasive techniques, such as sacral anterior root stimulator combined

*Correspondence: A Dahlberg, Käpylä Rehabilitation Centre, Finnish Association of People with Mobility Disabilities, Nordenskiöldinkatu 18 B, PO Box 103, 00251, Helsinki, Finland

with rhizotomy, have been developed.¹¹ Satisfactory outcomes, however, have been also reported with conservative methods,¹² which can be combined with medication to improve bladder function.

Recently, renal function has been reported to be adequately preserved in the great majority of persons with SCL independent of the method of bladder management,¹³ although chronic indwelling catheters may contribute to renal deterioration.¹⁴

In 1998, the Health Committee of Helsinki decided to evaluate the present health status and social situation of adults with traumatic SCL leading to permanent neurological deficits. The aim of the Helsinki Spinal Cord Injury Study (HSCIS) was to determine the prevalence of individuals with SCL and to evaluate their needs. The primary end point of the current study was to evaluate retrospectively the methods of bladder management reported by the subjects themselves in this population. The secondary end point was to assess the frequency of the self-reported UTI and the bother bladder problems caused to the subjects. Also medication used for bladder problems were noted.

Materials and methods

Subjects for the HSCIS were identified using the registers of the Käpylä Rehabilitation Centre, Helsinki University Central Hospital, and the local organization for the disabled. Local health centres were informed of

the study, residential service houses were contacted, and announcements were published in patient magazines. Case finding is described in more detail in Dahlberg *et al.*¹⁵

The cross-section date of the study was 1 January 1999. The data were collected between September 1999 and February 2001, with minimum follow-up of 1 year after the injury. A structured questionnaire was sent to the subjects. All who responded were invited to a clinical visit that lasted 3–4 h. The questionnaire as a whole consisted of 129 questions. In this report, only three questions dealing with the bladder were used and they are shown in Table 1. During the clinical visit, the physician interviewed the subjects according to their answers, and clinical investigation, including the American Spinal Injury Association (ASIA) classification,¹⁶ was performed. In this report, there were no data available about urodynamic evaluation covering the whole study-group.

The urological questions (Table 1) dealt with very detailed methods of bladder management: a total of 12 items could be chosen in this matter. On the basis of the answers, the subjects were divided into seven groups of bladder management: (1) normal voiding group, of subjects who reported no signs of neurogenic bladder dysfunction; (2) controlled voiding group, of subjects who themselves reported that they are able to control their voiding, but needed assisted bladder emptying f.ex. with the Crede manoeuvre, or who had urge- or stress-

Table 1 Urological questions

Question 1. Method of bladder management

How do you empty your bladder (you may tick several options)?

- Normal controlled voiding
- Controlled voiding, but from time to time problems (eg urge, leakage)
- Suprapubic tapping
- Compression
- Straining with abdominal muscles
- Urine leakage all the time
- Urine leakage between bladder emptying
- Intermittent catheterization
- Suprapubic catheter
- Indwelling urethral catheter
- Urinary deviation
- Other method, specify

Question 2. Urinary tract infection

Have you had urinary tract infection (with symptoms, confirmed by urinary culture and treated with antibiotics) during the last year (12 months)?

- No
- Yes

Question 3. Subjective disturbance

How much problems do the changes in bladder function due to spinal cord injury bother you?

- No changes in bladder function due to spinal cord injury
- Changes in bladder function, but no bother
- Minor bother (eg you have to take into consideration bladder-problems in daily living and when you are outside of home, but they don't restrict your life)
- Moderate bother (eg daily living or life outside of home is difficult, and your life is reasonably or from time to time limited)
- Significant bother (eg your daily living is markedly difficult and life outside of home is clearly limited)

incontinence; (3) CIC group, in which CIC was the only method of bladder emptying; (4) mixed group, in which CIC was in daily use, but the subjects also used other methods for bladder emptying (suprapubic tapping, spontaneous reflex voiding or compression or straining); (5) suprapubic tapping group, of subjects who used suprapubic tapping or spontaneous bladder emptying, usually to condom catheter; (6) compression or straining group, in which a Crede or Valsalva manoeuvre was used; (7) catheter or conduit group, including indwelling urethral or subrapubic catheters and an ileal conduit.

In results the catheter or conduit group is presented only in the text and not in the analysis, because as a method it is heterogeneous and very different from the other groups. Likewise, in statistical comparison between the subgroups the normal group was excluded, because there was subjectively no signs of neurogenic bladder.

The ASIA classification is widely used in spinal cord injury medicine. The ASIA Impairment Scale (AIS) reflects the completeness of the lesion: A = complete lesion, no sensory or motor function is preserved in the lowest sacral segments; B = sensory incomplete (including segments S4–S5), but no motor function below the neurological level; C = sensory and motor incomplete but more than half of the 10 pairs of key muscles have strength a grade less than 3 on a scale 0–5; D = sensory and motor incomplete, at least half of the key muscles have grade greater than or equal to 3; and E = sensory and motor function normal.

The comparison between the subgroups was made by χ^2 test. The confidence intervals were obtained by exact method.

Results

At the cross-section date of the study (1 January 1999), there were 546 000 inhabitants in Helsinki. In total, there were 152 cases of SCL, a prevalence of 28/100 000 inhabitants.¹⁵ A total of 131 subjects returned the questionnaire, but only 129 with adequate information about bladder management. So the final study-group consisted of 129 of 152 subjects (85%). Of these, 31 (24%) were female and 98 (76%) male. The mean age during the follow-up was 49 (SD 13) years and the mean time since the injury was 18 (SD 11) years.

A total of five (22%) subjects of the dropouts ($n = 23$) were female and 18 (78%) were male. The mean age during the follow-up was 46 (SD 12) years. There were no statistically significant differences between the dropouts and the study group.

Altogether 125 subjects made the clinical visit. Of these, five refused from ASIA examination due to personal reasons. Owing to this reason, data concerning completeness and level of the lesion were available from 120 subjects. In total, 52 (43%) had a complete lesion and 68 (57%) an incomplete lesion. A total of 56 (47%) subjects had tetraplegia and 64 (53%) paraplegia.

The distribution of the 129 subjects in each bladder management group is seen in Table 2. The catheter or

Table 2 Distribution of the subjects ($n = 129$) into the bladder management groups

Bladder management group	N (%)
1. Normal voiding	14 (11)
2. Controlled voiding	15 (12)
3. CIC	16 (12)
4. Mixed	30 (23)
5. Suprapubic tapping	31 (24)
6. Compression or straining	16 (12)
7. Catheter or conduit	7 (5)

conduit group comprised seven subjects: three who used a suprapubic, one a urethral catheter and three an ileal conduit.

The numbers of female, male subjects and each AIS in the six bladder management groups are shown in Figure 1. The AIS A is most represented in the mixed and suprapubic tapping groups. The AIS D is most represented in normal voiding and controlled voiding groups.

The frequency of UTI (at least one symptomatic UTI treated with antibiotics during the previous 12 months) in each bladder management group is shown in Figure 2. There was a statistically significant difference in the frequency of UTI between the bladder management groups ($P < 0.001$). The frequency of UTI was highest in the mixed group.

The subjective disturbance of bladder problems in each bladder management group is seen in Figure 3. There was no statistically significant difference ($P = 0.46$) in subjective disturbance (bladder management reported as a 'moderate' or 'significant' bother)

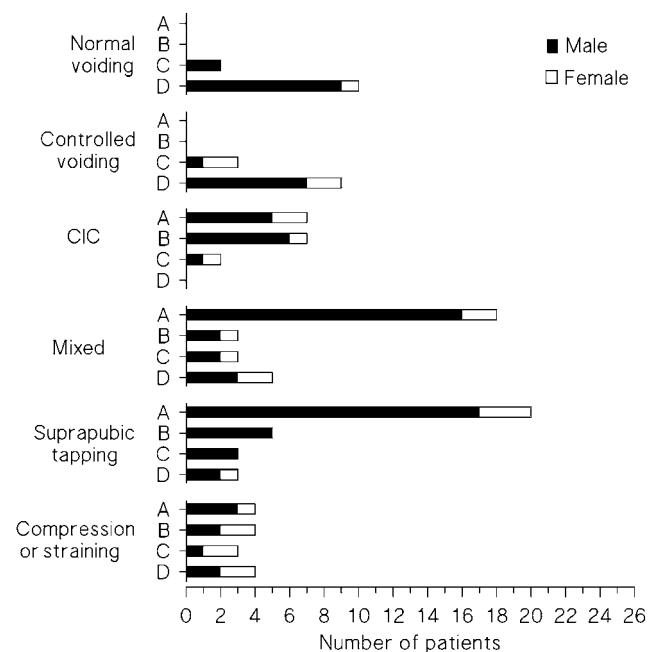


Figure 1 Numbers ($n = 115$) of female, male subjects and each AIS in the bladder management groups

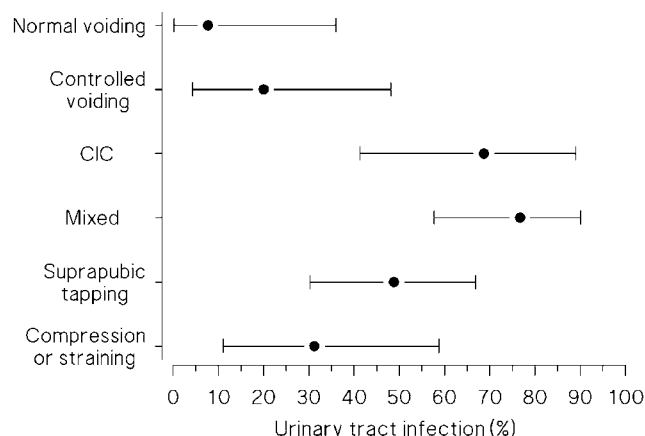


Figure 2 The proportion (95% confidence interval) of the subjects who had urinary tract infection during last 12 months in bladder management groups

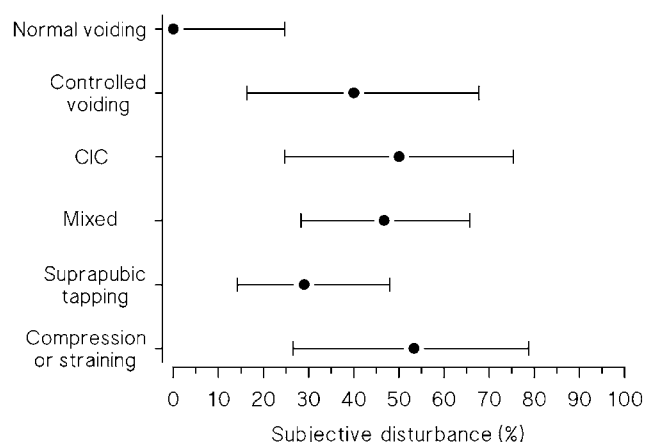


Figure 3 The proportion (95% confidence interval) of the subjects who reported the bladder management as a moderate or significant bother in bladder management groups

among the bladder management groups (the normal group was excluded from comparison). The subjective disturbance was highest in the compression or straining group.

Information about medication was available only from 119 subjects. In this prevalence population, a total of 33% of the subjects ($n = 39/119$) regularly used antibiotics (nitrofurantoin and/or trimetoprim, metenaminhippurate) to prevent UTI. Altogether six subjects used anticholinergics (oxybutin): three in the mixed, two in the compression or straining and one in the suprapubic tapping group. To enhance bladder emptying, three subjects used tamsulosin: one in the controlled voiding, one in the mixed and one in the compression or straining group.

Discussion

A reasonable effort was made to find as many subjects with SCL as possible. In the Stockholm Spinal Cord Injury Study¹⁷ (SSCIS) (using similar methods) the

prevalence rate was 22.3/100 000 inhabitants. The rate in Helsinki (28/100 000) is approximately similar. The final study group comprised 85% ($n = 129/152$) of the whole population with traumatic SCL. This study offers an opportunity to evaluate the method of bladder management reported by the subjects themselves compared to the completeness of the lesion in the spinal cord. To our knowledge, similar comparisons have not been reported earlier. In addition, the frequency of UTI, subjective disturbance of bladder problems and medication used for bladder problems are noted on a prevalence basis.

In the normal and controlled voiding group most of the subjects were in AIS D. However, it should be noted that some subjects with AIS D were classified also in other bladder management groups and subjects with AIS D may also have severe urological problems.

In the SSCIS,¹⁸ 34% of the subjects were classified in 'Normal micturition' group, but at least some of them had functional impairment or used even external compression over lower abdomen. In this study, the subjects who reported to have control over their voiding were divided into two groups: those who had no signs of neurogenic bladder (normal voiding group, 11% of the study group), and those who reported incontinence or had to assist voiding (controlled voiding group, 12% of the study group). A total of 40% of the subjects in the controlled voiding group reported bladder problems as moderate or significant bother compared to 0% in the normal voiding group. These two groups differed clearly from each other.

In this study, CIC was more commonly used than in the SSCIS.¹⁸ Altogether 36% of the subjects ($n = 46/129$) used CIC compared to 19% in the SSCIS.¹⁸ A total of 65% of the subjects ($n = 30/46$, the mixed group) using CIC also used other methods for bladder emptying. The frequency of UTI was highest in the mixed group. Some of the subjects in this group might benefit from anticholinergics to hinder spontaneous reflex bladder emptying and then use only CIC. Additionally, new methods such as botulinum-A toxin injections should be considered.¹⁹

The subjects in the suprapubic tapping group had less UTI than those who used CIC. Likewise, the bladder care did not seem to bother so much those subjects in the suprapubic tapping group than those who used CIC. Some subjects in the mixed group could manage better by suprapubic tapping as the only method. This could be combined with bladder outlet surgery, if needed.

The subjects in compression or straining group seemed to suffer most from bladder problems, but in this group the frequency of UTI was lower compared to other groups. Perhaps CIC should be introduced to the subjects in this group.

In this study, the frequency of UTI seems to be relatively high. Preventive medication against UTI was commonly used. Indwelling catheters were rare, which might indicate that personal assistance is readily available. All the catheters used by the CIC group were hydrophilic without jelly.

Conclusion

This study assessed the self-reported bladder management methods of individuals with traumatic SCL living in Helsinki. The subjects who used both CIC and other methods for bladder management had more problems than others. These subjects might manage better by using either CIC or suprapubic tapping as the only method for bladder emptying.

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