



Clean intermittent catheterisation from the acute period in spinal cord injury patients. Long term evaluation of urethral and genital tolerance

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Since its introduction by Lapedes, clean intermittent catheterisation (CIC) has dramatically changed the urological management of spinal cord injury (SCI) patients. Since 1978 we have used CIC as a mode of drainage in the acute period, during the period of bladder retraining as a measurement of residual urine, and in some instances in the medium and long term. 12-14 Fr PVC catheters are used with lubricant. The objectives of this study were: first, in a population of 159 SCI patients (group 1), to evaluate the overall incidence of complications of CIC; Secondly to study two groups of patients: group 2 ($n = 8$) consisted of patients who had performed CIC for over 2 years before discontinuance; group 3 ($n = 21$) consisted of patients on CIC for over 5 years (mean length of use: 9.5 years). The reasons for acceptance of long term CIC, frequency of urinary tract infections, and rates of urethral strictures were evaluated. The analysis of group 1 showed a rate of lower urinary tract infection of 28% and of cytobacteriological infection of 60%. Chronic pyelonephritis was never observed and infection was always confined to the lower urinary tract which is in accordance with other studies. The rate of epididymitis and urethral stricture was 10% and 5.3% respectively. Sixty two per cent of group 2 remained incontinent, and 89% of group 3 showed a satisfactory degree of continence. The first factor for acceptance of long term CIC is continence, the second one is the ability to perform CIC independently. In group 3 we found a rate of urethral stricture of 19%, and of epididymitis of 28.5%. These two complications (urethral tolerance and urethroprostatic infection) increased with the number of years on CIC. The method and the type of catheters used must also be considered. We need further studies of long term CIC in patients using non-reusable hydrophilic catheters from the acute period to see if these two complications can be prevented.

Keywords: long term clean intermittent catheterisation; spinal cord injury; urethral stricture; epididymitis; procreation

Introduction

Since its introduction by Lapedes in the early 1970s,¹⁻⁴ clean intermittent catheterisation (CIC) has proved its efficiency in the management of neuropathic bladders and has allowed a different approach to the problems of continence and dysuria. Our experience^{5,6,7} is based on more than 15 years of practice of this technique. The indications for CIC in spinal cord injury (SCI) patients are multiple. As a mode of voiding at the initial phase, we start CIC in the intensive care unit between the first and third day post-injury. During the period of bladder retraining, CIC allows measurement of residual urine. In the medium and long term, CIC is used as a mode of bladder emptying in some instances. This is the case in detrusor areflexia (flaccid paraplegia, cauda equina syndrome, conus medullaris syndrome), in which CIC drains the bladder, provides continence and protects the status of the pelvic floor. In those with a reflex type, CIC is a conservative treatment of detrusor sphincter dyssynergia, associated to anticholinergic drugs in case

of high intravesical pressures. Finally the choice of continence is sometimes the main motivation. This is the choice that we deliberately make in females with reflex bladders, in association with anticholinergic drugs to inactivate the detrusor. Several parameters determine the choice of the definitive voiding mode. Protection of the upper urinary tract is imperative and requires early diagnosis and treatment of high intravesical pressures. In our experience, a number of sphincterotomies have been performed in this context, when anticholinergic drugs were insufficient. The comfort of the patient, including the possible choice of continence, his/her independence, his/her personality, and his/her ability to perform the technique should also be considered.

The objectives of this study were triple. In a population of 159 spinal cord injured patients (group 1), we evaluated the overall rate of complications of CIC. We then focused on the indications of long term CIC in males and studied two other groups. Group 2

consisted of male patients who performed CIC for over 2 years and subsequently stopped. What were the reasons for discontinuance? Group 3 consisted of male patients on CIC for over 5 years and still using the method. What were the reasons for acceptance? What was the tolerance of the urethra, how frequent was epididymitis and what was its effect on procreation?

Material and methods

Group 1

This retrospective study relied on the analysis of 159 SCI patients hospitalised in our department during the period between January 1980 to October 1988, and using CIC from the acute period. These were 113 males and 46 females aged from 5 to 80 years (mean: 38 years). Fifty patients were tetraplegic, 67 had thoracic cord injuries (41 complete, 26 incomplete), 20 had a conus medullaris syndrome, and 22 a cauda equina syndrome. The aetiology was traumatic in 72%. The use of CIC was temporary in 92 patients, and 74 achieved another voiding mode after a mean length of use of CIC of 3.5 months (3 days–360 days). Of the 92 patients, 18 males underwent sphincterotomy. Sixty seven of the 159 patients continued to perform CIC in the medium or long term (mean: 2 years, 8 months). In this first group, the overall rate of complications such as infection of urinary tract, lithiasis, damage to the upper urinary tract, (pyelonephritis, dilatation) and urethral tolerance was evaluated during the period of CIC.

Group 2

This consisted of eight male patients only, who stopped CIC after having performed it for over 2 years, ie 3.6% of our male population. Their age ranged from 17 to 68 years (mean: 38). Their neurological level and their completeness (Frankel classification) is provided in Figure 1. Every patient had an intact parasympathetic centre and a spastic perineum. Regarding the spinal paralysis aetiologies, six were traumatic, one vascular, the last compressive (exostosis). Five patients had started CIC immediately after injury. In the other cases

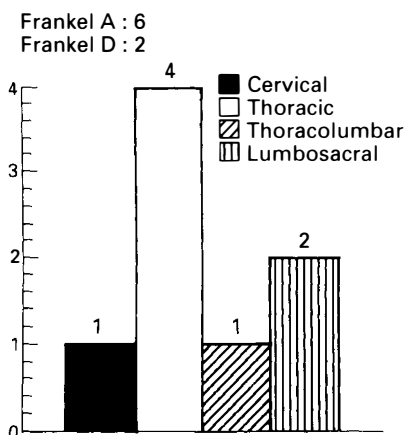


Figure 1 Neurological levels of group 2

the delay before starting was less than a month in one, and between the second and the third month post-injury in two. In all cases the indication for CIC was detrusor-sphincter dyssynergia, seven needing anticholinergic drugs. From a functional point of view, six were confined to a wheelchair. Each patient was asked about the reasons for discontinuance: choice of a more comfortable voiding mode, dependence on others for catheterisation, persistence of incontinence, change of bladder balance, urethral damage.

Group 3

Twenty one of the male patients who have been performing CIC for over 5 years were reviewed. The duration on CIC ranged from 5 to 17 years (mean: 9.5 years). Their age at the beginning of CIC ranged from 16 to 65 years (mean: 37.3 years). Thirteen had started CIC immediately, three in the first month post injury, three between the first and the third month post injury and two after 3 months. The aetiologies were mainly traumatic in 19 cases and vascular in two cases. The neurological level is shown in Figure 2. Seventeen patients were Frankel A, one Frankel B, two Frankel C and one Frankel D. Eight patients had a lesion of the sacral centre, seven a lesion of the sympathetic centre and 14 a spastic perineum.

From a functional point of view 16 remained confined to a wheelchair, five had recovered an ability to walk and two had a brachial plexic lesion, one being triplegic. These 21 patients underwent clinical examination and were questioned about their catheterisation procedure: frequency of catheterisation per day and the procedure itself. The frequency of urinary tract and genital infections was evaluated, as well as their present urethral status. The genital function was also evaluated: procreation on CIC, occurrence of ejaculation and the method used to obtain it. When reviewed all patients underwent a urodynamic study, IVU (intravenous urography) and retrograde urethrocytography.

Frankel A : 17
Frankel B : 1
Frankel C : 2
Frankel D : 1

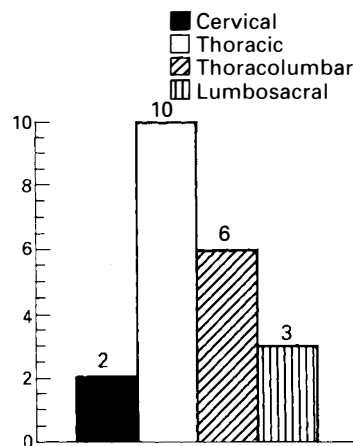


Figure 2 Neurological levels of group 3

Urine culture and a Meares–Steamey test (urine examination after prostatic massage) were performed. The appreciation of the technique was evaluated by a visual analogue scale of constraint-satisfaction ranging from 0 to 10.

We used the catheterisation procedure described by Lapides² and validated by Hinnmann⁸ which includes hand washing and cleaning of the meatal area with soap and water; insertion of the catheter after lubrication in males; voiding completed by manual compression; careful withdrawal of the catheter. The catheter was cleaned with soap and water and kept in a dry case. The same catheter was used for 1 week. The frequency of catheterisation was six or seven times a day. Daily diuresis was maintained between 1½ and 2 litres. We used ordinary 12-14 Fr catheters in PVC with lubricant. According to the princeps description of Lapides, the lubricant was applied in a generous fashion on the catheter and not in the urethra. The composition of the lubricant was exclusively vaseline without disinfectant. Our criteria of infection on CIC were significant bacteriuria, ie superior or equal to 100,000 per ml with same level leukocyturia.

Results

Group 1

One hundred and fifty nine cases were analysed to determine the general incidence of complications (Figure 3). Concerning infection, 60% of the patients had an asymptomatic cytobacteriological infection. In 65% of the cases, an increase in urinary output was sufficient to cure the infection (confirmed by urine culture control). Twenty eight per cent presented with a symptomatic lower urinary tract infection characterised by the appearance of incontinence, cloudy or malodorous urine and/or increase of spasms and positive urine culture. The comparison of the rate of infection between the male and female population showed that: 39.7% of the women and 66% of the men

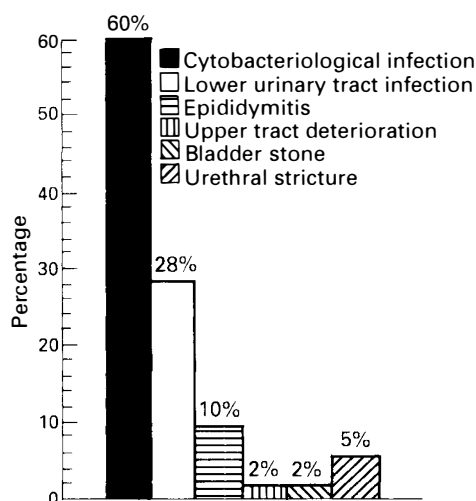


Figure 3 Overall rate of complications of CIC; 159 cases reviewed

had a cytobacteriological infection; 17.3% of the women and 32.7% of the men a symptomatic lower urinary tract infection. In both groups the difference was significant ($P < 0.05$). Epididymitis occurred in 10% of males. Bladder stone occurred in 2%. Deterioration of the upper urinary tract (hydronephrosis, vesico-ureteral reflux) occurred in 2% of the patients and was always correlated to high intravesical pressures. Urethral stricture occurred in 5.3% of the male population with a mean delay of 2 years, 6 months. Chronic pyelonephritis was never observed.

Group 2

Five patients (62%) were incontinent despite the use of anticholinergic drugs. The mean delay before discontinuance of catheterisation was 5.25 years, 4 if we exclude a patient who stopped catheterising after 14 years. The reasons for discontinuance are multiple: persistent incontinence in 62% of the cases, upper urinary tract deterioration in one (hydronephrosis), increasing difficulty in catheterisation in four patients and urethral stricture in one.

The final choice of voiding was an indwelling catheter in an aged patient and in the seven other cases reflex voiding, three times after sphincterotomy and once after urethrotomy.

Group 3

We now consider the 21 male patients on CIC for over 5 years. The indications to continue CIC were detrusor areflexia in 10 cases, detrusor sphincter dyssynergia in 11 cases, and associated with anticholinergic drugs in seven cases (the aim being continence or protection of the upper urinary tract).

These twenty one patients were questioned about the procedure used for catheterisation. The mean daily frequency of catheterisation was 6.1. Seventeen patients washed their hands, 17 kept their catheter in a dry case, 14 cleaned their catheter with water and soap, three used antiseptics. Four patients used a new catheter at each catheterisation, and 17 reused them, three for 1 day, three for 2 or 3 days, eight for a week, and three longer. The mean number of catheterisations performed with the same catheter was overall 61.2.

In analysing acceptance of CIC in this population, 12 patients did not have any other voiding choice, seven would have had possibilities of reflex voiding if a sphincterotomy had been performed, and two deliberately chose continence.

The analysis of the degree of continence showed permanent incontinence in one case, occasional incontinence (wearing of a condom at night, or to go out) in two, some accidents in seven cases, and total continence in 10 (three with anticholinergic drugs). The appreciation of this technique on a visual analogue scale of constraint-satisfaction ranging from one to ten showed a mean satisfaction of 7.57 globally correlated to the continence.

From a practical point of view the technique was performed in less than 5 min and in any circumstances in 20 patients.

The rate of infections in this population was evaluated by the frequency of treatments for symptomatic infections and cytobacteriological infections. Symptomatic infections occurred less than once every 2 years in 11 patients, less than once a year in one, once or twice a year in five, and twice to four times a year in four. Concerning the cytobacteriological infections, 15 patients presented with less than one infection every 2 years, two less than one per year, two once or twice a year and the last two patients had a permanent antibiotic prophylaxis. Bacteriological examination was performed on each patient when reviewed: urine culture was positive in four cases, sterile in 17. To detect prostatitis we performed the Meares–Steamey test on twelve patients. This test was considered positive in four cases (33.3%).

We then focused our attention on this population on urethral tolerance and urethral status. Difficulties in inserting the catheter occurred in 11 patients and were repeated in two cases pluridaily, daily in one, several times a week in two, and less often in six. Catheterisation was sometimes impossible in five patients. In this population of 11 patients, the mean frequency of catheterisation was 6.31 per day *versus* 5.8 in the others. Seven were spastic, four were flaccid. Endoscopic examinations were performed in nine patients and revealed four urethral strictures, in two cases striated sphincter spasticity, in one hypertrophy of bladder neck and striated sphincter, and were normal in two patients. The localisation of the urethral strictures was bulbar in three cases, retromental in one case. Two urethrotomies and two dilatations were performed. The interval before occurrence was 4.9 years, and the frequency of catheterisation in these cases was 7.2 per day *versus* 5.05 in the others.

When reviewed all patients had an intravenous urography and a retrograde urethrocytography. In one case we found chronic pyelonephritis. On retrograde urethrocytography we observed prostatic calculi in 16 cases, urethroprostatic reflux in 12, spasms of the external sphincter in 10 cases. No patient had a false passage. The rate of epididymitis, in this population of long term CIC, was 28.5%. Five patients presented with one episode, one with two. We did not find any correlation between the incidence of epididymitis and the duration of indwelling catheter at the acute phase: three patients among the six who presented episodes of epididymitis had started CIC immediately, one with a delay of less than 1 month, two with a delay of less than 3 months. Three patients procreated on CIC, respectively at 5, 6 and 9 years post injury. Seven spermograms were performed in the ten patients having potential ejaculations. Two patients with azoospermia were found, one in a patient who had presented with an episode of epididymitis.

Discussion

Our comments will focus on the acceptance factors of long term CIC, the rate of infection of the urinary tract,

the urethral tolerance, the rate of general infections and their consequences for procreation.

Acceptance factors

In our global population, we found only eight patients (group 2), who, having practised CIC for at least 2 years, subsequently stopped. This small number indicates that in most cases the definitive choice of voiding mode is made within 2 years post injury. This group consists exclusively of dyssynergic patients who had first chosen continence with conservative treatment. Sixty two per cent of this group remained incontinent and thus suffered the disadvantages of both techniques: the wearing of a condom and catheterisation. In practice, if continence is not obtained, we advise our patients to use their potentiality of voiding, if necessary after sphincterotomy.

On the other hand, the study of the third group, who have been using the technique of CIC for over 5 years showed a satisfactory degree of continence in 89%. The first factor of acceptance of long term CIC was continence as shown by the use of a visual analogue scale of constraint-satisfaction: mean score 7.57 directly correlated to continence.

The second factor of acceptance is directly linked to the autonomy of the patients vis à vis the technique. In the first group 12 of the 18 patients who had undergone sphincterotomy, were tetraplegic. The analysis of the group 3 (long term CIC) showed independent performance of catheterisation in all cases, 20/21 being able to carry it out anywhere, under any circumstances and in less than 5 min. This fact has already been pointed out in the literature.^{9,10} In his population of 50 patients, Perkash noted a discontinuance in four out of the seven tetraplegic patients catheterised by others. On the contrary, all of his patients performing long term CIC were independent. 'CIC is a successful long term option to drain bladders in spinal cord injury patients who can perform catheterisation independently'.¹⁰ Bakke in recent studies^{11,12} confirmed that CIC was well accepted by most of his patients. Among those who practiced CIC independently 68.2% were never averse, 25.8% sometimes and 6% always.¹¹ Age and sex seemed to be determinant, young patients and females being more averse to CIC than others. Aetiology, disability, length of use had no predictive value in the score of distress. In fact aversion to CIC in 30% of cases seemed to be linked to a subjective approach to the situation, to an emotional state, and above all to non-acceptance of a chronic disability.

Urinary tract infection

In the 159 patients of group 1, 60% presented with a cytobacteriological infection, and 28% with a lower urinary tract infection. Chronic pyelonephritis was never observed. In the long term group (group 3) 55% of the cases presented with less than one symptomatic infection, and 71% with less than one cytobacteriological infection every 2 years. Two decades after the description of CIC by Lapides,^{1,2} we still find a number

of publications concerning urinary tract infection on CIC,^{13,14} but practical conclusions are difficult because criteria of infection on CIC vary among the authors. Kühn¹⁵ underlines these controversies, some authors meaning symptomatic infections and others cytobacteriological infections. However, in all studies^{3,9,10,13,15,16} infections were confined to the lower urinary tract. At present, many authors consider that bacteriuria is the direct consequence of a clean technique, and has a poor correlation with clinical urinary tract infection.¹⁷ Bakke¹³ in his study of 302 patients using CIC and followed for a year found three predictive factors of infection: high mean catheterisation volume, low frequency of catheterisation, and urine leakage in men needing a condom.^{10,17} These findings corroborate the theoretical and conceptual basis of CIC, ie host resistance ('frequency rather than sterility')³ and the necessity of a strict CIC regimen.⁸

Urethral stricture

The rate of urethral stricture in the male population varies in the literature from 1.2%,⁹ 6%,¹⁶ to 21%.¹⁸ In group 1, we found a rate of 5.3%. After 5 years of CIC (group 3; mean length of use 9.5 years), the rate was 19%, with a mean delay of occurrence of 4.5 years. Thus the risk of urethral stricture, a complication of the technique of CIC, seems to increase with the number of years on CIC. This fact has been underlined by Wyndaele¹⁸ who reported urethral stricture in 21% of his cases after 5 years on CIC. Urethral stricture is the direct consequence of a urethral inflammatory response to repeated urethral catheterisation. The frequency of catheterisation, necessary in a strict regimen of CIC (six, seven per day), appears to increase the development of urethral damage and in our patients who developed urethral stricture the frequency of catheterisation was slightly higher than in the rest of the population (7.2 versus 5.8). The type of catheters used for catheterisation seems to be important. Vaidyanathan¹⁹ studied the degree of urethral inflammation in patients practising CIC by urethral cytology in two groups of patients on CIC: one using ordinary catheters in PVC with lubricant, the other using hydrophilic catheters (Lofric catheters, Astra Tech, Mölndal, Sweden). He clearly showed that a urethral inflammatory response to repeated catheterisation was significantly less in the group using hydrophilic catheters. Waller²⁰ found a urethral stricture rate of 15% in male patients practising CIC (hydrophilic catheter) with a mean delay of follow-up of 7 years, but these patients presented with signs of urethral strictures at the beginning of the CIC regimen after the indwelling catheter had been removed. She noted that there was no increase of urethral complications with time since injury. Bakke²¹ in his follow-up of 302 patients practising CIC with hydrophilic catheters during a year found a rate of urethral stricture of 1.3%. It is thus reasonable to think that the systematic use of hydrophilic catheters may in the long term decrease the incidence of urethral stricture. However we need further studies on the long term urethral tolerance in patients using hydrophilic

catheters from the acute period. Moreover hydrophilic catheters are not reusable and the systematic use of this type of catheter in a programme of CIC will increase the cost. At present we use a hydrophilic catheter exclusively when there are difficulties in inserting catheters in male patients due to spasm of the external sphincter or if there is a urethral stricture. The rate of urethral stricture in male patients using CIC implies systematic detection. Clinical information is the most significant factor, including increasing difficulties in catheterisation and resistance when withdrawing the catheter. These findings require endoscopic examination to make the diagnosis. Retrograde uretrocytography is not often helpful because the visualisation of the bulbar and posterior urethra is often difficult. The treatment of these strictures is still subject to discussion. Half of our patients were treated by urethrotomy and the others by dilatation. Some authors²² reported the efficiency of CIC itself in dilating the urethra and recommended the use of hydrophilic catheters such as the Lofric catheter. The occurrence of a urethral stricture does not impose the discontinuance of CIC and we believe that a balance can be obtained between urethral stricture and the dilatation during catheterisation itself. Urethral stricture is a situation in which the use of hydrophilic catheters is indicated.

Genital infections and procreation

Prostatitis was evaluated by the Meares–Steamey test and we found a rate of 33%. The diagnosis of acute prostatitis in SCI patients is in reality very difficult and there is little to be found in the literature on this subject. Allas²³ reported a rate of acute prostatitis of 22.5% in patients using CIC. Chronic prostatitis is more often difficult to diagnose, the significance of chronic prostatic calculi or urethroprostatic reflux being controversial. However prostatic contamination with CIC seems to be a real problem.

Concerning epididymitis we found a rate of 28.5%. Review of the literature shows rates ranging from 9%,¹⁶ 10%¹⁰ to 19%,¹⁸ 35%,²³ but there are not many studies regarding long term CIC. The analysis of our group 1 showed a rate of 10% and in our group 3 (long term CIC) we found a rate near to 30%; the rate of epididymitis seemed to be correlated with the number of years of CIC. Previous studies which have evaluated the rate of epididymitis in SCI patients whatever mode of voiding used, reported a rate of 30%.²⁴ Thus CIC neither increases, nor decreases the risk of epididymitis in SCI patients and the problem of urethro-prostatic infection remains. The consequence of genital infection on procreation is dramatic.²⁵ In 1991 Allas²⁶ reported a population of 14 paraplegic individuals on CIC. In each patient he performed two spermograms, one before and one after an episode of epididymitis, which remained unilateral in 13 cases. His results showed an increase of the incidence of azoospermia from 7% before the epididymitis to 50% after. If the occurrence of epididymitis does indeed induce azoospermia in 40–50% the question of the risk of sterility becomes crucial. The mechanisms of azoospermia are either

excretive (obstruction of vas deferens or epididymal ducts) or secretive in the case of epididymo-orchitis. On the other hand Ohl²⁷ reported that sperm mobility was better in males with SCI on CIC or post-sphincterotomy than in those who achieved bladder drainage with a Foley catheter or high pressure reflex voiding. They believed that poorer sperm motility in those with reflex voiding compared to those on CIC was due to high voiding pressure at the origin of urethroprostatic reflux.

Thus many questions remain about the prevention of infertility in SCI males, which is multifactorial, but the prevention of epididymitis is of primary importance. This may be simply a question of technique. At present grouped under the term CIC, we find two techniques: the common denominator is the cleanliness of catheterisation, the variable is linked to the frequency of change of the catheter. In North America, as in our study, the catheter is reused and in Scandinavia a new hydrophilic catheter is used for each catheterisation.^{11-13,20,21} In his study of 302 patients (149 males), followed over a year, Bakke *et al*²¹ found one case of epididymitis. The use of low friction catheters may be the prime reason for a decrease of urethroprostatic infection, and thus of the risk of epididymitis.

Conclusion

To conclude, CIC is an excellent technique in minimising urinary complications in SCI patients. Its introduction has dramatically changed the neurourological management of SCI patients, and has made the development of low intravesical pressure techniques through surgery and pharmacology possible.

However two long term problems remain: that of urethral tolerance, and that of epididymitis, the consequence of persistent urethroprostatic infection. It is necessary to find a better technique to prevent these complications and for these reasons we need comparative studies on long term CIC (5-10 years) between two groups of patients; the first group practising CIC with ordinary catheters and reusing them, the second one using non-reusable hydrophilic catheters.

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