COMPLICATIONS ASSOCIATED WITH CLEAN INTERMITTENT CATHETERIZATION IN CHILDREN WITH SPINA BIFIDA

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ABSTRACT

Purpose: Clean intermittent catheterization (CIC) is commonly used in the management of voiding dysfunction associated with neurospinal dysraphism. We determined the incidence of genitourinary complications associated with this technique in a population of children with spina bifida.

Materials and Methods: The charts of all children younger than 13 years attending a multidisciplinary spina bifida clinic between 1987 and 2002 were reviewed. Children in whom CIC had been performed for a minimum of 5 years were identified. Catheterization was performed with a polyvinyl chloride catheter and a water-based lubricant. All genitourinary complications that had occurred in this group were recorded. The caregiver of each patient was then contacted by telephone to confirm the accuracy of our data.

Results: There were 32 females and 27 males identified in whom CIC had been performed for a minimum of 5 years. Mean duration of CIC was 10.5 years (range 5 to 15). Of the patients 45 (76%) learned to perform CIC independently at a mean age of 8 years (range 4.7 to 15.3). Two complications were gross hematuria and a false passage in the bulbar urethra. Both complications occurred in males early in the course of CIC, and while being performed by a caregiver. Neither complication was associated with long-term sequelae.

Conclusions: The incidence of genitourinary complications associated with CIC in children with spina bifida is low. We identified 2 complications during a period of 570 patient-years for an incidence of 3.5 complications/1,000 patient-years (95% confidence interval –1.3, 8.3) of observation.

KEY WORDS: child, spinal dysraphism, urinary catheterization

The benefits of clean intermittent catheterization (CIC) have been well established in children with neurogenic bladder dysfunction secondary to neurospinal dysraphisms.1–4 Despite its widespread use, the incidence of associated genitourinary complications in this specific patient population is not well described. We determined the incidence of genitourinary complications associated with the long-term use of CIC in a population of children with spina bifida.

MATERIALS AND METHODS

All children born in northern Alberta with myelomeningocele are registered with the multidisciplinary Spina Bifida Clinic at the Glenrose Rehabilitation Hospital in Edmonton, Alberta. The children are cared for by a team of physicians and allied health care professionals, including a single pediatric urologist. The primary caregiver of each child requiring catheterization is instructed to perform CIC with a polyvinyl chloride (PVC) catheter and a water-based lubricant. The catheter is cleaned after each use, and reused for approximately 1 week. When appropriate, children are encouraged to learn the technique and catheterize independently.

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The charts of all children younger than 13 years attending the multidisciplinary Spina Bifida Clinic between 1987 and 2002 were reviewed. Children in whom CIC had been performed for a minimum of 5 years were identified. All genitourinary complications that had occurred in this group were recorded. The caregiver of each patient was then contacted by telephone to confirm the accuracy of our data. Internal review board approval of the study was obtained from the Glenrose Rehabilitation Hospital and the University of Alberta Hospitals.

RESULTS

A total of 137 children younger than 13 years had been followed at the multidisciplinary Spina Bifida Clinic for 5 or more years. Of these patients 52 were voiding spontaneously at low detrusor pressures, 5 required a vesicostomy, 2 had cloacal exstrophy, 2 had incomplete charts and 76 required CIC. Of these 76 patients 32 females and 27 males had been using CIC for a minimum of 5 years. Mean duration of CIC for this group was 10.5 years (range 5 to 15), with an overall duration of 570 patient-years. Forty-five patients (76%) learned to perform CIC independently at a mean age of 8 years (range 4.7–15.3).

Two genitourinary complications were identified, for an incidence of 3.5 complications/1,000 patient-years (95% confidence interval –1.3, 8.3) of observation. Both complications occurred in males early in the course of CIC and while being performed by a caregiver. The first patient experienced transient initial gross hematuria following an otherwise uncom-
complicated catheterization. The second patient had a false passage in the bulb urethra following several failed attempts at passing the catheter. An indwelling catheter was subsequently placed for 3 days, following which CIC was resumed without difficulty. Neither complication was associated with long-term sequelae. Of the 59 caregivers 50 were available for telephone interview. All respondents stated that their child had not experienced any genitourinary complications in addition to those recorded in the chart, and that they had not sought the care of another pediatric urologist during the study period.

**DISCUSSION**

The purpose of this study was to determine the incidence of genitourinary complications associated with the long-term use of CIC in a population of children with spina bifida. Complications were encountered in 2 patients (3.6%) for an incidence of 3.5 complications/1,000 patient-years of observation. Neither complication was associated with long-term sequelae. These results are consistent with those of Miguelez Lago et al who identified 2 complications in 88 children with neurospinal dysraphism during a period of 5 years.5

Our results are limited by the retrospective nature of this study. Although we were able to contact the majority of the caregivers (85%) to corroborate our findings, prospective data would strengthen our conclusions. The urinary tract infection rate was not recorded. These data are difficult to collect accurately in a retrospective fashion. We do know that in the majority of patients CIC is associated with bacteriuria, regardless of technique.6

None of the patients was catheterizing via a continent catheterizable stoma such as a Mitrofanoff nor had any received an artificial urinary sphincter or sling. In such cases one would expect a higher incidence of associated complications. In some patients with neurogenic bladder dysfunction augmentation cystoplasty may be required. Although this may result in a higher incidence of hematuria due to complications such as the hematuria-dysuria syndrome and bladder calculi, it should not, on its own, lead to a higher incidence of catheter related complications.

In an effort to improve the ease of catheterization and decrease the incidence of associated genitourinary complications, hydrophilic catheters have been designed and are now available for use in North America. Following immersion in water for 30 seconds, the surface of the catheter becomes slippery. This is believed to result in decreased friction, thereby reducing urethral mucosal irritation and related complications, such as the development of a urinary tract infection and urethral strictures. Vaidyanathan et al were able to demonstrate a significantly higher proportion of polymorphs to epithelial cells on urethral cytology in PVC catheter users compared to hydrophilic catheter users, and concluded that the use of a hydrophilic catheter is associated with a significantly lesser degree of urethral inflammatory response.8 Similarly, Biering-Sorensen et al counted urethral epithelial cells on the surface of catheters in an effort to gauge the degree of urethral trauma associated with catheterization.8 Their study did not include a comparison of PVC catheters to hydrophilic catheters.

The clinical significance of the ratio of polymorphs-to-epithelial cells on urethral cytology and the number of urethral epithelial cells on the surface of a catheter following catheterization have yet to be determined. The incidence of urethral strictures associated with long-term intermittent catheterization with either PVC or hydrophilic catheters is similar, ranging between 0% and 13% and 0% and 19%, respectively.9-12 Furthermore, intermittent catheterization has been used in the management of recurrent stricture disease following internal urethrotomy. In this setting the stricture recurrence rate has been shown to be similar for red rubber, PVC and hydrophilic catheters.12-14 A number of short-term randomized studies have been conducted to compare PVC to hydrophilic catheters. Sutherland et al documented fewer episodes of microscopic hematuria associated with the hydrophilic catheter. In addition, the hydrophilic catheter scored higher with regard to catheter convenience and insertion comfort.15 Vapnek et al also noted less hematuria associated with the hydrophilic catheter compared to the PVC catheter.16 There was no difference in urinary tract infection rate between groups. Similarly, Pachler and Frimodt-Moller were unable to show a difference in urinary tract infection rate.17 In contrast to the findings of Sutherland et al,15 they were also unable to show a difference between catheters with regard to handling, discomfort or patient preference.17

The majority of our patients perform CIC 4 times daily. The expense associated with this catheterization regimen is not insignificant. Each PVC catheter costs $1.45 and is used for approximately 7 days. An additional expense of $2.50 per tube of water based lubricant is also incurred with this regimen. The cost for 1 year is approximately $100. In contrast, each hydrophilic catheter costs $2.50 and is used once. A water based lubricant is not required. The cost for 1 year would be approximately $3,650. All costs are in United States dollars.

Despite the difference in cost, it appears that the PVC and hydrophilic catheters are equivalent with regard to clinically significant outcomes. However, we agree with Hedlund et al that to reach a solid conclusion with regard to the purported benefits of the hydrophilic catheter, we must perform a long-term, prospective, randomized multicenter trial.18 Until that time, patients will have to choose a catheter based on financial considerations and personal preference.

**CONCLUSIONS**

The incidence of genitourinary complications associated with the long-term use of CIC in children with spina bifida is low. We identified 2 complications during a period of 570 patient years for an incidence of 3.5 complications/1,000 patient-years (95% confidence interval –1.3, 8.3) of observation.

Sally Martin and Gloria Harrison assisted with data collection.

**REFERENCES**

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