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Original Article

A comparison of bowel care patterns in patients with spinal cord injury: upper motor neuron bowel *vs* lower motor neuron bowel

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Study design: A face-to-face interview survey.
Objective: To compare bowel care patterns in spinal cord injury (SCI) patients based on type of neurogenic bowel.
Setting: Department of Physical Medicine and Rehabilitation of a tertiary university hospital in Suwon, Korea.
Methods: Among chronic SCI patients, 22 patients with upper motor neuron bowel (UMNB) and 20 patients with lower motor neuron bowel (LMNB) participated in an interview survey for the evaluation of bowel care patterns.
Results: The patients with LMNB demonstrated increased frequency of defecation, increased frequency of fecal incontinence, increased use of oral medications for bowel care, increased required time for defecation and more diet modification than those with UMNB ($P<0.05$). However, there was no significant difference in the subjective difficulty of bowel care. Among several available bowel care methods, suppositories were used most frequently by the UMNB group, whereas the Valsalva maneuver was the most frequently used method by the LMNB group.
Conclusions: Patients with LMNB tend to suffer more difficulties in management of their neurogenic bowel than those with UMNB. Therefore, more intensive and aggressive bowel care programs should be provided for SCI patients with LMNB.
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Keywords: neurogenic bowel; spinal cord injury

Introduction

The effects of neurogenic bowel on the quality of life after spinal cord injury (SCI) are significant:[1–11] 27% to 90% of SCI patients reported that problems related with their neurogenic bowel significantly affected their quality of life.[7,12–14] Moreover, SCI patients rated the magnitude of their bowel dysfunction higher than that of their urinary problems in one report.[13]

Traditionally, neurogenic bowel after SCI can be classified into two types: upper motor neuron bowel (UMNB) and lower motor neuron bowel (LMNB). UMNB results from a lesion of the spinal cord above the conus medullaris. LMNB represents a pattern of colonic dysfunction resulting from a lesion affecting parasympathetic cell bodies at the conus, their axons in the cauda equina, or the pelvic nerve. The basic differences are the presence of spinal cord-mediated reflex peristalsis and the integrity of the pudendal nerve.[15]

During the management of neurogenic bowel in patients with SCI, we noticed significant differences in bowel care patterns between the two types of neurogenic bowel, which would thus require different bowel care programs based on their clinical differences. However, to the best of our knowledge, there have been few reports comparing bowel care pattern between the two groups and little data collected on the clinical characteristics of patients with LMNB.

Consequently, the purpose of this study was to evaluate the clinical characteristics of neurogenic bowel in patients with SCI based on the type of neurogenic bowel in order to provide better information for the development of effective bowel care programs for SCI patients.

Methods

Among 111 SCI patients who visited the Department of Physical Medicine and Rehabilitation of Ajou University Medical Center, Suwon, Korea from

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January 1999 and August 1999, 42 SCI patients who consented to this survey and met the following inclusion criteria were included. The inclusion criteria were as follows: (1) SCI patients who had lived at home for at least 6 months after the acute hospitalized-rehabilitation management for SCI; and (2) The Functional Independent Measure score for bowel care had to be 5 or more.

We classified neurogenic bowel into two types based on the neuronal involvement. Twenty-two patients were classified as UMNB and 20 patients were classified as LMNB. UMNB was defined as when the spinal cord lesion was above the sacral level. LMNB was defined as when the lesion involved the sacral spinal cord, roots, or peripheral nerve innervation of the colon. All subjects with LMNB showed evidence of denervation in the bilateral lower extremities and bilateral bulbocarvernosus muscles by electrodiagnostic study.

The demographic characteristics of the subjects are presented in Table 1. There was no significant difference in the demographic characteristics between the UMNB group and the LMNB group. The distribution according to the ASIA Impairment Scale is demonstrated in Figure 1 and no significant difference in the ASIA impairment scale was found between the two groups ($P>0.05$).

Face-to-face interviews were conducted with the subjects on the following bowel care issues: (1) frequency of defecation; (2) frequency of fecal incontinence; (3) required time for defecation; (4) number of oral medications used for bowel care; (5) subjective difficulty of bowel care on activities of daily living using visual analog scale (VAS) where 0 represented no subjective difficulty and 10 represented the most severe difficulty; (6) methods of bowel care; and (7) use of diet modification for bowel care. The required time for bowel care was defined as the total time taken from initiating bowel care with suppository, digital anal stimulation, the Valsalva maneuver, enema or other methods to completing the bowel care procedure.

Independent *t*-testing was used to analyze the differences between the two groups.

Results

There were significant differences between the two groups in frequency of defecation, frequency of fecal incontinence, required time for defecation, and number of oral medications used for bowel care (Table 2). Five of 22 UMNB patients and 10 of 20 LMNB patients used oral pharmacological agents to facilitate their bowel care. The oral medications used for bowel care included laxatives (senna, bisacodyl or magnesium), prokinetic agents (metoclopramide, cisapride or levo-sulpride) or a bulk-forming agent (psyllium).

Figure 2 shows the comparison of bowel care methods between the two groups. On average, each patient with UMNB used 1.86 methods for bowel care, whereas each patient with LMNB used 1.65 methods ($P>0.05$). Among several methods of bowel care, suppositories (12 patients) were used most frequently by the UMNB group while manual anal manipulation (11 patients), the Valsalva maneuver (nine patients), and abdominal massage (six patients) were the next most frequently used methods for bowel care by the UMNB group. In the LMNB group, the Valsalva maneuver (16 patients) and manual anal manipulation (13 patients) were the two most frequently used methods. When compared with the UMNB group, suppositories and abdominal massage were used less in the LMNB group.

With regard to diet modification; two patients modified their diet with either high fiber foods (one patient) or yogurt (one patient) in the UMNB group, whereas in the LMNB group, seven patients modified their diet with either high fiber foods (four patients), tea (two patients) or coffee (one patient).

Discussion

According to our literature review, little descriptive data exists on the characteristics of LMNB, because most studies on neurogenic bowel excluded the LMNB

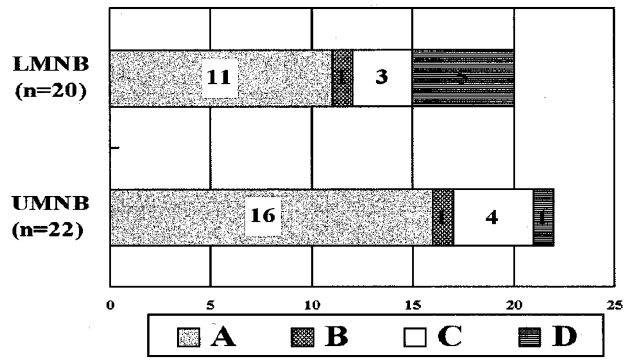

Figure 1 Distribution of subjects according to the ASIA Impairment Scale (UMNB: upper motor neuron bowel; LMNB: lower motor neuron bowel)

Table 1 Demographic characteristics of subjects

Characteristics	*UMNB** (n=22)	*LMNB*** (n=20)	P *value*
Age (years)	31.41±8.97	35.75±9.40	
Male-to-female ratio	16:6	15:5	>0.05
Duration of spinal cord injury (months)	30.55±22.75	26.30±14.75	

*Upper motor neuron bowel; **lower motor neuron bowel

Table 2 Characteristics of bowel patterns for patients with spinal cord injury according to type of neurogenic bowel

Characteristics of bowel care patterns	*UMNB* group*	*LMNB** group*	P *value*
Frequency of defecation per day	0.46 ± 0.25	1.95 ± 3.05	0.028
Frequency of fecal incontinence per month	0.21 ± 0.39	2.61 ± 3.95	0.017
Required time for defecation per week (min)	184.70 ± 119.21	395.54 ± 425.38	0.044
Number of oral medications used for bowel care	0.27 ± 0.46	0.95 ± 1.11	0.012
Subjective difficulty of bowel care on visual analog scale	5.00 ± 2.83	6.20 ± 2.26	> 0.05

*Upper motor neuron bowel; **lower motor neuron bowel

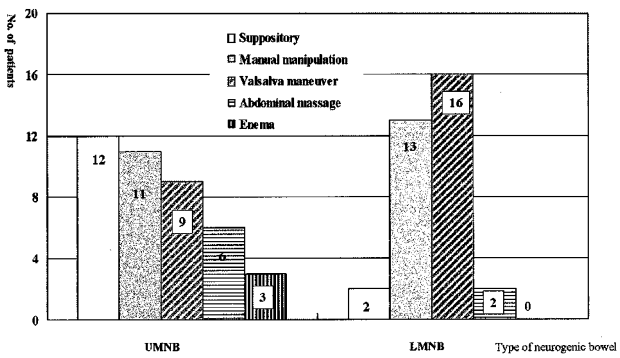

Figure 2 Comparison of bowel care methods based on type of neurogenic bowel. (UMNB: upper motor neuron bowel; LMNB: lower motor neuron bowel)

group because their bowel management was often thought to be quite different from the UMNB group due to the different pathophysiology.[8,16] Our findings revealed that there were several significant differences in clinical characteristics between UMNB and LMNB, especially in frequency of defecation, frequency of fecal incontinence, required time for defecation, and number of oral medications used for bowel care. There were also differences in the bowel care methods.

Regarding frequency of defecation, this study revealed that patients with UMNB emptied their bowels about three times a week, whereas individuals with LMNB emptied their bowels about twice a day. The previous studies[5,16] also reported that the UMNB group emptied their bowels two to three times a week, which is consistent with our findings. Among SCI patients, the LMNB group has been described as having more constipation with a high risk of incontinence due to lax external anal sphincter mechanism. The levator ani muscle is flaccid, causing the sigmoid colon and rectum to bulge below the perineum with a reduced rectal angle and thereby opening the rectal lumen, which increases the risk of incontinence.[17] Consequently, in order to avoid fecal incontinence, the LMNB group tended to perform their bowel care program about twice a day. Despite this frequent bowel care program, the LMNB group in our study experienced fecal incontinence 2.61 times per month. Fecal incontinence of this frequency has an impact on the social and emotional well-being of individuals with SCI. The fact that the LMNB group needs a twice-a-day bowel program and has a high frequency of fecal incontinence suggests that their quality of life is more negatively impacted than in the UMNB group. However, in our study, there was no significant difference in subjective difficulty of bowel care on activities of daily living between the two groups. Glickman and Kamm[13] reported that SCI patients rated the magnitude of their bowel dysfunction as 5.1 with VAS in which 0 represented no perceived problems and 10 represented maximum problems. This finding was very similar to that of our findings for the UMNB group (5.00 ± 2.83). In our study, the required time for defecation for UMNB was 184.70 ± 119.21 min per week, or an average of about 57.36 min per defecation, while the required time for defecation for LMNB was 395.54 ± 425.38 min per week, or an average of about 28.98 min per defecation. Therefore, we were able to find one of the possible reasons that the subjective difficulty in bowel care on activities of daily living was not significantly different for both groups. Although the LMNB group had a higher frequency of defecation than the UMNB group, their bowel program seemed to be completed within 30 min and therefore seemed to be able to tolerate such a higher frequency of defecation.

Two patients modified their diet with high fiber food (one patient) or yogurt (one patient) in UMNB group, whereas seven patients of LMNB group modified their diet with high fiber food (four patients), green tea (two patients) and coffee (one patient). Interestingly, there were no published reports to show evidence that increased dietary fiber resulted in improved bowel function in SCI patients.[2,17] In fact, several studies have shown that increased fiber might have opposite effects in SCI patients than that seen in able-bodied persons. Although unproven, there is likely to be some benefit to the inclusion of a reasonable amount of fiber in the daily diet of SCI patients and a minimum of 15 g of fiber is recommended in the daily diet.[1] In our study, more patients with LMNB switched to high fiber foods than those with UMNB and they reported some benefits with this modification. Therefore, studies should be done to prove the effect of high fiber diet on the neurogenic bowel of SCI in the near future. On the other hand, fluid intake has a significant effect on the water content of stool and influences stool consis-

tency.[2] However, there is no established guideline on the appropriate amount of fluids that should be included in the diet of an individual with SCI to optimize bowel function and management.[2] Furthermore, in order to determine the appropriate amount of fluids, one must take into account the type of neurogenic bowel as well as the method of bladder management. At the same time, other dietary and nutritional factors should be considered in promoting effective bowel management.

In our study, five of 22 UMNB patients and 10 of 20 LMNB patients used oral pharmacological agents to facilitate their bowel care. A greater number of patients in the LMNB group used oral pharmacological agents for their bowel care, but overall, the use of oral medications was not required or necessary in the majority of patients with SCI to effectively manage their bowel. Through proper diet and fluid management, many individuals were able to maintain adequate stool bulk and consistency without oral medications.

The most frequently used methods for the UMNB group were suppository and manual anal manipulation, while the Valsalva maneuver and manual anal manipulation were the most frequently used methods for the LMNB group. Considering the theoretical basis of this difference, irritant suppositories would not have been effective for LMNB group because LMNB is characterized by the absence of spinal-mediated reflex activity.[2] As we could see in our findings, manual removal of stool from the rectum and the Valsalva maneuver were usually required for persons with LMNB in order to manage their bowels. Thus, some management such as the appropriate use of stool softners and/or bulk forming agents may be considered for easier digital evacuation of stool to prevent unexpected soiling.[2]

We should mention that there were several methodological limitations in this study. First, this study was an interview study that mainly relied on memories of patients and their caregivers. Secondly, we could not survey the amount of fiber and fluid intake, which could directly influence the bowel habit of patients with SCI. Despite these limitations, this study provided some descriptive data on the differences of bowel care patterns between the UMNB and the LMNB.

In conclusion, management of LMNB tends to be more problematic than that of UMNB among SCI patients. Therefore, an intensive bowel care program needs to be developed for SCI patients with LMNB.

References

1 Banwell JG, Creasey GH, Aggarwal AM, Mortimer JT. Management of the neurogenic bowel in patients with spinal cord injury. *Urol Clin North Am* 1993; **20:** 517–526.
2 Chen D, Nussbaum SB. The gastrointestinal system and bowel management following spinal cord injury. *Phys Med Rehabil Clin N Am* 2000; **11:** 45–56.
3 Goetz LL, Hurvitz EA, Nelson VS, Waring III W. Bowel management in children and adolescents with spinal cord injury. *J Spinal Cord Med* 1998; **21:** 335–341.
4 Harari D *et al*. Constipation-related symptoms and bowel program concerning individuals with spinal cord injury. *Spinal Cord* 1997; **35:** 394–410.
5 Kannisto M, Rintala R. Bowel function in adults who have sustained spinal cord injury in childhood. *Paraplegia* 1995; **33:** 701–703.
6 King JC, Currie DM, Wright E. Bowel training in spinal bifida: importance of education, patient compliance, age, and anal reflexes. *Arch Phys Med Rehabil* 1994; **75:** 243–247.
7 Kirk PM *et al*. Long-term follow-up of bowel management after spinal cord injury. *SCI Nurs* 1997; **14:** 56–63.
8 Kirshblum SC, Gulati M, O'Connor KC, Voorman SJ. Bowel care practices in chronic spinal cord injury patients. *Arch Phys Med Rehabil* 1998; **79:** 20–23.
9 Looze DD *et al*. Constipation and other chronic gastrointestinal problems in spinal cord injury patients. *Spinal Cord* 1998; **36:** 63–66.
10 Menter R *et al*. Bowel management outcomes in individuals with long-term spinal cord injuries. *Spinal Cord* 1997; **35:** 608–612.
11 Rajendran SK *et al*. Gastrointestinal transit after spinal cord injury: effect of cisapride. *Am J Gastroenterol* 1992; **87:** 1614–1617.
12 Levi R, Hulting C, Nash MS, Seiger A. The Stockholm spinal cord injury study: 1. Medical problems in a regional SCI population. *Paraplegia* 1995; **33:** 308–315.
13 Glickman S, Kamm MA. Bowel dysfunction in spinal-cord-injury patients. *Lancet* 1996; **347:** 1651–1653.
14 Stone JM, Nino-Murcia M, Wolfe VA, Perkash I. Chronic gastrointestinal problems in spinal cord injury patients: a prospective analysis. *Am J Gastroenterol* 1990; **85:** 1114–1119.
15 Stiens SA, Bergman SB, Goetz LL. Neurogenic bowel dysfunction after spinal cord injury: clinical evaluation and rehabilitative management. *Arch Phys Med Rehabil* 1997; **78:** S86–S102.
16 Han TR, Kim JH, Kwon BS. Chronic gastrointestinal problems and bowel dysfunction in patients with spinal cord injury. *Spinal Cord* 1998; **36:** 485–490.
17 Bartolo DCC *et al*. Differences in anal sphincter function and clinical presentation in patients with pelvic floor descent. *Gastroenterology* 1983; **85:** 68–75.