

ORIGINAL RESEARCH

Outcomes of Neurogenic Bowel Management in Individuals Living With a Spinal Cord Injury for at Least 10 Years



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Abstract

Objective: To describe bowel management and its outcomes in individuals living with a spinal cord injury (SCI) for at least 10 years.

Design: Cross-sectional multicenter study.

Setting: Dutch community.

Participants: Individuals (N=258; age range, 28–65y) who acquired their SCI between 18 and 35 years of age, who were at least 10 years post-SCI, and who used a wheelchair for their daily mobility.

Interventions: Not applicable.

Main Outcome Measures: The International SCI Bowel Function Basic Data Set, the neurogenic bowel dysfunction (NBD) score, and a single item on satisfaction with bowel management.

Results: Mean time since injury (TSI) was 24±9 years. Seventy-four percent used ≥1 conservative bowel management method, specifically digital evacuation (35%) and mini enemas (31%). Transanal irrigation (TAI) and surgical interventions were used by 11% and 8%, respectively. Perianal problems were reported by 45% of the participants. Severe NBD was present in 36% of all participants and in 40% of those using a conservative method. However, only 14% were (very) dissatisfied with their current bowel management. Dissatisfaction with bowel management was significantly associated with constipation and severe NBD. With increasing TSI, there was a nonsignificant trend observed toward a decline in dissatisfaction with bowel management and a significant decline in severe NBD.

Conclusions: Although satisfaction rates were high, more than a third of the participants reported severe NBD and perianal problems. Apart from severe NBD, there were no significant associations between bowel problems and TSI. Conservative methods were most often used, but some of these methods were also significantly associated with the presence of severe NBD. Longitudinal research is necessary to provide more knowledge concerning the course of NBD with increasing TSI.

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In patients with spinal cord injury (SCI), neurogenic bowel dysfunction (NBD) causes colonic and anorectal dysfunction, resulting in constipation and fecal incontinence. NBD is one of the main secondary health conditions (SHCs) resulting from SCI that hampers an

active lifestyle and impacts negatively on quality of life.¹⁻⁵ In a Dutch survey, for instance, bowel problems were rated by 42% of 454 participants with SCI as one of the most important SHCs they experienced.⁵ Coggrave et al⁶ assessed NBD with a postal questionnaire among 1334 persons who had suffered an SCI at least 1 year ago. The most commonly reported problems were constipation (39.0%), hemorrhoids (36.0%), and abdominal distension (31.0%). In another study, no less than 39.4% of 142 individuals with SCI reported severe NBD according to their NBD score.⁷ To date, only 1 study of NBD

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after SCI with a longitudinal design has been performed. Faaborg et al⁸ assessed NBD 10 years apart, with a mean time since injury (TSI) of 14 years at the first assessment. The proportion of participants defecating less than every second day increased significantly from 11% to 16% over time, whereas the number of participants reporting fecal incontinence at least once a month decreased significantly from 22% to 17%. The mean NBD score did not change.

Although NBD is common in persons living with SCI, studies have shown that satisfaction with bowel management appears high (80%–85%).^{6,9} In both studies, satisfaction was significantly associated with the duration and frequency of bowel care.

Bowel management is an individualized bowel routine aimed at a predictable and regular evacuation of the feces, continence, and prevention of constipation and perianal problems. It has a stepwise hierarchical approach, beginning with conservative methods such as digital anorectal stimulation, digital evacuation, and/or the use of rectal laxatives (eg, suppositories, mini enema). If this does not lead to a satisfactory situation, the next step is transanal irrigation (TAI).¹⁰⁻¹² Finally, surgical interventions such as sacral anterior root stimulation (SARS) and ostomy surgery provide an option when other methods have failed.^{13,14}

Several studies, mostly cross-sectional in design and with mean TSI ranging between 3 and 29 years, have described bowel management and its associations with demographic characteristics, injury-related characteristics, and bowel problems in groups of individuals with SCI living in the community.^{2-4,6,9,15-19} However, most studies used self-constructed questionnaires so that their results are difficult to compare.^{2,4,6,9,17,19} had small sample sizes ($N \leq 100$) and therefore lacked precision,^{3,17-19} or only described the use of the conservative approaches.^{9,15,16,19}

The aim of the current study was therefore to describe long-term bowel management and NBD in individuals who have been living with an SCI for at least 10 years in The Netherlands. This study is part of the Dutch multicenter research program called Active Lifestyle Rehabilitation Interventions in aging Spinal Cord injury.²⁰ Research questions of the current study were as follows. First, which bowel management methods are currently used by individuals with long-term SCI? For this purpose, bowel management was divided into 4 categories: no intervention, conservative bowel management, TAI, and surgical bowel management. Second, what is the prevalence of perianal problems, constipation, fecal incontinence, severe NBD, and dissatisfaction with current bowel management? Finally, what are the associations between demographic and injury-related characteristics and bowel management, severe NBD, and satisfaction with bowel management?

Methods

Design

This study was a TSI-stratified cross-sectional study among individuals with long-term SCI living in The Netherlands. TSI strata

were 10 to 19, 20 to 29, and ≥ 30 years after SCI. It was aimed to include 100 individuals per stratum.

Participants

Inclusion criteria were as follows: (1) traumatic or nontraumatic SCI with a TSI of at least 10 years; (2) age at injury between 18 and 35 years; (3) current age between 28 and 65 years; and (4) using a wheelchair (hand-rim propelled, electric), at least for longer distances ($>500\text{m}$). Persons were excluded if they had insufficient mastery of the Dutch language to respond to an oral interview.

Procedure

Eligible individuals were identified through databases from all 8 Dutch rehabilitation centers specializing in SCI rehabilitation. In the first round, 62 individuals per center were invited for the study. If the number of eligible individuals allowed it, a random sample per center was drawn. If the response was <30 to 35 individuals per center, an additional sample was drawn at that center.

The study consisted of a 1-day visit to the rehabilitation center for a check-up, including an extensive medical assessment and physical examination performed by a rehabilitation physician and an oral interview and several physical tests performed by a research assistant.²¹ Two weeks before the visit to the rehabilitation center, participants were asked to complete a self-report questionnaire.²¹

The research protocol was approved by the Medical Ethics Committee of the University Medical Center Utrecht. All participants gave written informed consent.

Instruments

Data on medication use were extracted from consultation with the physician and medical file.

Bowel management and bowel problems were described using the International SCI Bowel Function Basic Data Set, a standardized 12-item assessment of bowel function.²² Digital evacuation was defined as the need to dig out stools from the bowel with a finger. Digital anorectal stimulation was defined as digital (manual) triggering of rectal contractions and anal relaxation to cause rectal emptying. In contrast with the Data Set, we did not differentiate between main and supplementary defecation methods. For the categorization of the 4 bowel management strategies (no intervention, conservative, TAI, surgical), we only reported the use of the most invasive defecation method. For instance, if a participant used a combination of TAI and digital evacuation, he/she was included in the TAI category and not in the conservative category. Furthermore, we used a time frame of 3 months instead of 4 weeks to avoid short-term fluctuations in the chronic situation.

In addition to this Data Set, constipation during the last 3 months was recorded according to the Rome III criteria²³; 2 items regarding the participant's ability to perform bowel management were included from the Spinal Cord Independence Measure, version III²⁴; and 1 question was asked about the participant's satisfaction with current bowel management on a 5-point scale from very satisfied to very dissatisfied.

The International Standards for Neurological Classification of Spinal Cord Injury were used to assess lesion characteristics.²⁵ Tetraplegia was defined as a lesion at or above the first thoracic segment, and paraplegia was defined as a lesion below

List of abbreviations:

NBD	neurogenic bowel dysfunction
OR	odds ratio
SARS	sacral anterior root stimulation
SCI	spinal cord injury
SHC	secondary health condition
TAI	transanal irrigation
TSI	time since injury

the first thoracic segment. A complete lesion was diagnosed in the absence of motor and sensory function in the sacral segments (ie, ASIA Impairment Scale grade A). ASIA Impairment Scale grades B, C, and D were considered to represent an incomplete lesion.

The NBD score is a 10-item symptom-based score for NBD in individuals with SCI.²⁶ It covers both constipation and fecal incontinence. The maximum total NBD score is 47 points. The interpretation of the total NBD score is very minor NBD (0–6), minor NBD (7–9), moderate NBD (10–13), and severe NBD (≥ 14).

Statistics

Descriptive analyses were used to describe participants' demographic and injury-related characteristics, bowel management, frequency of reported bowel problems, and satisfaction with bowel management.

The chi-square test was used to explore associations between the categorical variables. Because age and total NBD score were normally distributed, the independent samples *t* test was used to compare 2 independent groups regarding these continuous measures. TSI was not normally distributed; therefore, the Mann-Whitney *U* test was used to test for differences between 2 independent groups regarding this continuous measure.

Chi-square tests were used to test associations between different categorical variables and the 4 bowel management categories. Significant differences in mean age between the bowel management categories were tested using 1-way between-group analysis of variance, whereas the Kruskal-Wallis test was used for the same purpose for the TSI variable. In case of a significant association, we explored the association further by comparing each bowel management category with each of the other 3, leading to 6 comparisons.

Associations between modes of bowel management and other variables were assessed one by one, each comparing the subgroup of participants using a particular bowel management method with all other participants. This was chosen because of the relatively large number and mostly small size of the bowel management subgroups.

We controlled for type I errors by applying a Bonferroni correction for a number of analyses. First, this was done for the associations between bowel management categories and demographic and injury-related characteristics (significance set at $P < .0083$). Second, it was applied for the associations of bowel management with bowel problems and satisfaction with bowel management (significance set at $P < .00625$). Third, it was applied for the associations between satisfaction with bowel management and bowel problems (significance set at $P < .01$).

Finally, variables showing a significant bivariate association with severe NBD and with satisfaction with bowel management were included in a multiple logistic regression analysis.

All analyses were performed using the SPSS statistical software program (SPSS version 21.0 for Windows³).

Results

Participant characteristics

Between November 2011 and February 2014, a total of 282 individuals participated in the check-up, 258 (91.5%) of whom also completed the self-reported questionnaire and were included in

the current study. The characteristics of this sample are described in [table 1](#). Completeness of the lesion and age were the only demographic- or injury-related characteristics significantly associated with TSI. There was a significant increase in age ($P < .001$) and a significant decrease in complete motor and sensory lesions ($P = .009$) with increasing TSI.

Bowel management

[Table 2](#) summarizes the bowel management results. The most commonly used defecation methods (as main or supplementary method) were digital evacuation (35%) and mini enemas (31%).

Relations between demographic characteristics and the 4 bowel management categories are displayed in [table 1](#). Participants using surgical bowel management were significantly older ($P = .008$) and had a significantly longer TSI ($P = .002$) than those using TAI. They also had a significantly longer TSI than those using a conservative bowel management method ($P = .002$). The no intervention group included significantly fewer participants with complete SCI than the other bowel management groups ($P < .001$ for all 3 comparisons).

Bowel problems

Reported perianal problems are also shown in [table 2](#). Forty-five percent of the participants had experienced ≥ 1 perianal problem over the last 3 months. Hemorrhoids (39%) and constipation (25%) were the most frequently reported problems.

[Figure 1](#) shows the proportion of participants reporting bowel problems in each of the 3 TSI groups. [Table 3](#) shows the proportion of participants reporting bowel problems for each defecation method. Significant associations are also displayed.

NBD score

Overall, 36% of the participants suffered from severe NBD. The proportion of participants with severe NBD decreased over time from 44% to 26% (see [fig 1](#)), and an increase in TSI was significantly correlated with a decrease in the total NBD score ($\rho = -.183$; $P = .003$). Experiencing severe NBD was associated with the use of suppositories and digital evacuation (see [table 3](#)). Severe NBD was also positively associated with completeness of the lesion ($P = .010$) and was negatively associated with increasing age ($P = .038$).

A multiple logistic regression analysis with severe NBD as the dependent variable showed that completeness of the lesion (odds ratio [OR] = 1.98, $P = .046$), use of suppositories (OR = 4.02, $P < .001$), and digital evacuation (OR = 2.40, $P = .003$) were significant predictors of severe NBD.

Satisfaction with bowel management

Fourteen percent of the participants ($n = 37$) were dissatisfied or very dissatisfied with their bowel management. Persons who used digital anorectal stimulation were most likely to be dissatisfied with their bowel management (see [table 3](#)). No association between bowel management methods and satisfaction with bowel management was found, however (see [table 3](#)). Dissatisfaction with bowel management was associated with having perianal problems ($P = .005$), constipation ($P = .001$), and severe NBD ($P < .001$). Twenty-six percent of the participants with severe NBD were dissatisfied or very dissatisfied compared with 8.0% of those without severe NBD.

No associations were found between satisfaction with bowel management and demographic (age, sex) or lesion characteristics

Table 1 Participant characteristics

Characteristic	Total (N = 258)	No Intervention (n = 19)	Conservative Bowel Management		Surgical Bowel Management	Significance
			(n = 190)	TAI (n = 29)	(n = 20)	
Age (y), mean (range)	48 (29–65)	52 (34–65)	48 (29–65)	45 (29–64)	54* (43–65)	.003†
Sex, % male	73	55	75	77	52	.088
Cause, % traumatic	90	75	88	100	95	.085
Level, % tetraplegia	40	32	41	41	40	.890
AIS grade, %						<.001†
A	70	20†	71	80	80	
B	12	10	13	10	10	
C	9	15	10	3	10	
D	9	55	6	7	0	
TSI (y), mean (range)	24 (10–47)	29 (10–47)	24 (10–47)	22 (10–46)	29§ (14–42)	<.001†
TSI strata (y), %						
10–19	36	21	38	55	5	
20–29	35	21	37	24	40	
≥30	29	58	25	21	55	

Abbreviation: AIS, ASIA Impairment Scale.

* Participants using surgical bowel management were significantly older than those using TAI ($P = .008$).

† Significant associations ($P < .0083$).

‡ The no intervention group included significantly fewer participants with complete SCI than the other 3 bowel management groups ($P < .001$ for all 3 comparisons).

§ Participants using surgical bowel management had a significantly longer TSI than participants with conservative bowel management ($P = .002$) and those using TAI ($P = .002$).

(TSI, completeness, tetraplegia/paraplegia, traumatic/nontraumatic). The need for help with defecation was not associated with satisfaction with bowel management either.

A multiple logistic regression analysis with satisfaction with bowel management as the dependent variable showed that constipation (OR = 3.16, $P = .003$) and severe NBD (OR = 3.53, $P = .001$) were significant predictors of dissatisfaction with bowel management.

Discussion

The present study is one of the few studies addressing bowel management and NBD in persons with long-term SCI. Conservative defecation methods were the most frequently used across all 3 TSI strata. We did not find indications for a decrease in bowel function over time: longer TSIs were associated with less severe NBD, and TSI was unrelated to satisfaction with bowel management.

Two previous studies also reported digital evacuation to be the most commonly used intervention.^{2,6} The reported use of suppositories (18%) is in the lower range of previously reported percentages (15%–54%).^{2,4,6,16} The use of mini enemas (31%) was higher than the 6% to 11% use of enemas described elsewhere.^{2,4,6,16} In The Netherlands, suppositories for suprasacral lesions are generally prescribed when bowel management is done in a supine position, and mini enemas are prescribed when this is done in a sitting position.

TAI was used by only 11% of the participants, and even fewer participants (8%) had undergone a surgical intervention as part of their bowel management. Three percent reported having had a colostomy, 3.5% reported having SARS, and 1.9% reported having an ileostomy. Coggrave et al⁶ reported a similar percentage for colostomies (2.4%) but a lower percentage for SARS (0.5%).

These small percentages illustrate the hierarchical stepwise approach in the treatment of NBD and suggest possible reluctance to advise surgical interventions for bowel management.¹⁴

The proportion of participants with perianal problems was relatively large (45%). Twenty-five percent reported having complaints of constipation, which is lower than the percentages that have been described in previous studies (39%–58%).^{3,6,15,17} Severe NBD was present in 36% of all participants. A notable finding was that 41% of the participants using TAI reported severe NBD, which was nearly double the percentage reported by participants using a surgical defecation method. This incidence of severe NBD is similar to the 39% reported by Liu et al.⁷ However, in contrast with our findings, Liu⁷ reported longer duration of injury (TSI ≥ 10y) to be a risk factor for severe NBD. One possible explanation for these diverging results is that we did not include individuals with a TSI < 10 years. Alternatively, because NBD also reflects the severity of the SCI, the significantly lower percentage of participants with complete motor and sensory lesions in the longest TSI group might partially explain the decline in severe NBD. Furthermore, Krause²⁷ suggested that individuals who survive the longest after SCI are those with better adjustment patterns. It therefore seems plausible that individuals who have survived the first 3 decades after SCI are those who are less prone to SHCs (eg, severe NBD).

The levels of satisfaction with bowel management we found were relatively high and contrasted with the prevalence of perianal problems and severe NBD. This might be explained by some kind of acceptance of the situation regarding bowel problems which has grown over the years. Furthermore, the bowel problems may have been worse and more unsatisfactory in the past. Similar levels of satisfaction were found in previous studies.^{6,9} Fifty-seven percent of the participants dissatisfied with severe NBD used a combination of conservative defecation methods, which means that it is

Table 2 Description of bowel function according to the International Bowel Function Basic Data Set (version 1.1)

Item	n (%)
Gastrointestinal or anal sphincter dysfunction unrelated to the spinal cord lesion	
No	245 (95.0)
Yes	12 (4.7)
Unknown	1 (0.4)
Surgical procedures on the gastrointestinal tract	
No	177 (68.6)
Appendectomy	18 (7.0)
Cholecystectomy	18 (7.0)
Colostomy	7 (2.7)
Ileostomy	6 (2.3)
Other	31 (12.0)
Hemorrhoidectomy	12 (4.7)
SARS implantation	19 (7.4)
Prolapse surgery	3 (1.2)
Closure of intestinal perforation	3 (1.2)
Closure of gastric perforation	2 (0.8)
Other	14 (5.4)
Awareness of the need to defecate	
Normative	43 (16.7)
Indirect	116 (45.0)
None	99 (38.4)
Defecation method and bowel care procedures	
Normative defecation	19 (7.4)
Straining/bearing down to empty	31 (12.0)
Digital anorectal stimulation	40 (15.5)
Suppositories	47 (18.2)
Digital evacuation	89 (34.5)
Mini enema (clysma≤150mL)	80 (31.0)
Enema (>150mL)	6 (2.3)
Colostomy	7 (2.7)
SARS	8 (3.1)
Other method	
Ileostomy	5 (1.9)
TAI	29 (11.2)
Tapping/abdominal massage	4 (1.6)
Average time required for defecation (min)	
0–5	45 (17.4)
6–10	41 (15.9)
11–20	29 (11.2)
21–30	40 (15.5)
31–60	55 (21.3)
>60	33 (12.8)
Unknown	3 (1.2)
Not applicable (stomas)	12 (4.7)
Frequency of defecation	
≥3 times per day	6 (2.3)
Twice daily	13 (5.0)
Once daily	81 (31.4)
Not daily but more than twice every week	123 (47.7)
Twice every week	26 (10.1)
Once every week	2 (0.8)
Less than once every week, but at least once within the last 4 weeks	1 (0.4)
No defecation the last 4 weeks	0 (0.0)
Unknown	6 (2.3)

Table 2 (continued)

Item	n (%)
Frequency of fecal incontinence	
≥2 episodes per day	2 (0.8)
1 episode per day	0 (0.0)
Not every day but at least once per week	13 (5.0)
Not every week but more than once per month	10 (3.9)
Once every month	17 (6.6)
Less than once per month	73 (28.3)
Never	137 (53.1)
Unknown	6 (2.3)
Need to wear pad or plug	
Daily use	27 (10.5)
Not every day but at least once per week	3 (1.2)
Not every week but at least once per month	4 (1.6)
Less than once per month	4 (1.6)
Never	212 (82.2)
Unknown	8 (3.1)
Medication affecting bowel function/constipating agents	
No	160 (62.0)
Yes, anticholinergics	55 (21.3)
Yes, narcotics	10 (3.9)
Yes, other	
Nonsteroidal anti-inflammatory drugs	18 (7.0)
Antiepileptic drugs	22 (8.6)
Bisfosfonates	10 (3.9)
Calcium carbonate	9 (3.5)
Calcium antagonists	6 (2.5)
Selective serotonin reuptake inhibitors	7 (2.7)
Oral laxatives	
No	154 (59.7)
Yes, osmotic laxatives	65 (25.2)
Yes, bulking laxatives	48 (18.6)
Yes, irritant laxatives	28 (10.9)
Yes, prokinetics	0 (0.0)
Yes, other	0 (0.0)
Unknown	2 (0.8)
Perianal problems	
None	142 (55.0)
Hemorrhoids	101 (39.1)
Perianal sores	6 (2.3)
Fissures	10 (3.9)
Rectal prolapse	10 (3.9)
Other	
Rectal bleeding	4 (1.6)
Perianal abscess	1 (0.4)
Unknown	0 (0.0)

especially this group of patients who needs our attention during follow-up care.

We observed a trend toward greater satisfaction with bowel management with increasing TSI. This may be correlated with the observed decline in severe NBD over time or it might illustrate increased acceptance with the current situation concerning bowel function and bowel management. Longitudinal research is necessary to clarify this matter.

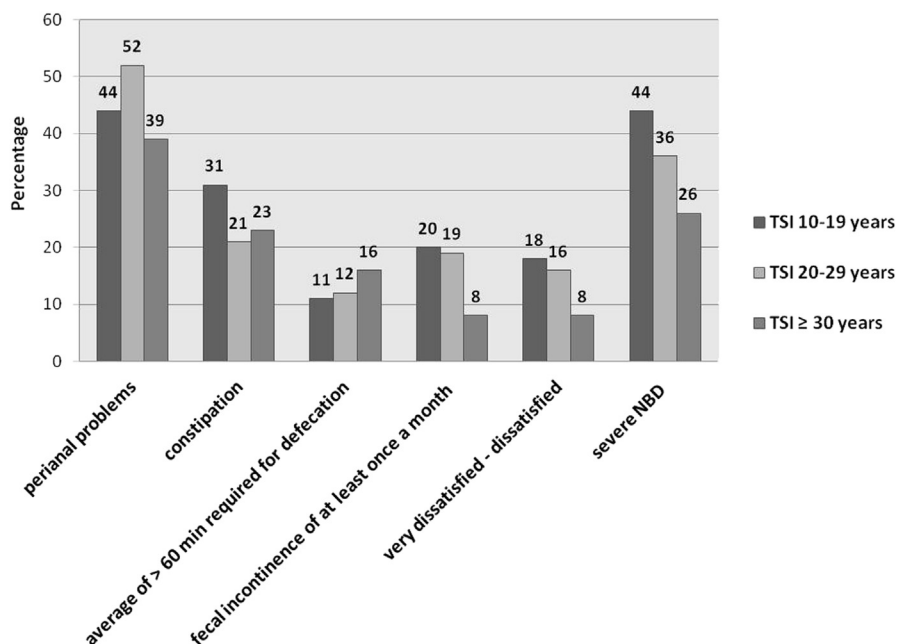


Fig 1 Proportion of participants reporting bowel problems by TSI group.

Table 3 Proportion of participants reporting bowel problems, severe NBD, and dissatisfaction by defecation method

Bowel Management	Perianal Problems (%)	Constipation (%)	Average of >60min Required for Defecation (%)	Fecal Incontinence of at Least Once a Month (%)	Severe NBD (%)	Dissatisfied/Very Dissatisfied (%)
Total (N = 258)	45.0	25.2	12.8	16.3	36.1	14.3
No intervention (n = 19)	26.3	31.6	0.0	10.5	5.3 (P = .002, OR = 0.09)*	0.0
Conservative bowel management						
Straining/bearing down to empty (n = 31)	45.2	29.0	0.0	19.4	22.6	19.4
Digital anorectal stimulation (n = 40)	57.5	45.0 (P = .003, OR = 2.98)*	12.5	15.0	55.0	25.0
Suppositories (n = 47)	48.9	25.5	38.3 (P < .001, OR = 8.11)*	17.0	57.8 (P = .002, OR = 2.99)*	19.1
Digital evacuation (n = 89)	51.7	20.2	15.7	13.5	51.1 (P < .001, OR = 2.67)*	16.9
Mini enema (clyisma ≤ 150ml) (n = 80)	56.3	27.5	5.0	13.8	41.3	13.8
TAI (n = 29)	41.4	27.6	24.1	34.5	41.4	17.2
Surgical bowel management (SARS, colostomy/ileostomy) (n = 20)	20.0	10.0	10.0 [†]	10.0	21.1	10.0 [‡]

NOTE. Only significant associations (P < .00625) are shown.

* Significant associations.

[†] Not applicable for colostomy/ileostomy.

[‡] All of these participants were SARS users.

Implications

Our study shows that conservative bowel management methods were most often used; however, some of these conservative methods were associated with severe NBD. Our results emphasize that during follow-up, clinicians must continuously evaluate whether the current bowel management methods are still satisfactory or whether interventions (eg, TAI, surgical procedures) should be considered. Our results show that TAI was not successful in all participants using this method. However, we may assume that they used TAI because their previous bowel management was even less satisfactory. If TAI does not result in a satisfactory situation, surgical procedures can be the next step.¹⁴ A systematic review of the outcomes in patients with SCI and gastrointestinal symptoms managed by conservative interventions versus colostomy or ileostomy showed that a significant proportion of the patients who underwent ostomy surgery were satisfied with their surgery, and in retrospect 86% to 92% of them would have liked to be counseled about this option earlier.²⁸ This is in accordance with our study results because none of the participants who underwent ostomy surgery were dissatisfied with their bowel management. In view of these data and the current literature, these surgical procedures may provide a solution for individuals who use conservative methods but experience severe NBD and dissatisfaction with their bowel management.

Longitudinal research focusing on the effects of aging with SCI in general and the impact on the gastrointestinal tract in particular is necessary to provide more knowledge concerning the course of NBD with increasing TSI. Moreover, there is a need for more knowledge about the long-term effects of TAI and surgical interventions for NBD, so that patients and clinicians can make a considered decision about switching from a conservative intervention.

Study limitations

The cross-sectional design of this study limits the possibilities to interpret associations with TSI caused by a possible (onset) cohort effect. The inclusion criteria also meant that our study sample consisted of a selected group, predominantly including participants with a traumatic and complete SCI who had acquired their SCI at a relatively young age. This does not correspond with the general SCI population.²⁹ Furthermore, our analyses were exploratory and hampered by the limited number of participants in several bowel management groups.

Conclusions

Over one third of the participants in this study reported severe NBD and perianal problems. Satisfaction with bowel management was nevertheless high and there was, in contrast with our expectations, a decline in severe NBD with increasing TSI and a trend toward a decline in dissatisfaction with bowel management. Conservative bowel management methods were most often used, but the results of this study suggest that therapeutic interventions (eg, TAI, surgical procedures) might be considered more often in cases of severe NBD and dissatisfaction with bowel management.

Supplier

a. SPSS version 21.0; IBM.

Keywords

Long-term care; Neurogenic bowel; Rehabilitation; Spinal cord injuries

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