Japanese Journal of Comprehensive Rehabilitation Science (2019)

Original Article

Transanal irrigation for bowel dysfunction in chronic stage of spinal cord-injured patients

Megumi Ozeki, MD, DMSc,[1] Hitoshi Kagaya, MD, DMSc,[2] Seiko Shibata, MD, DMSc,[2] Keiko Onogi, MD, DMSc,[3] Tomohisa Sugiyama, OTR, MAS,[1] Eiichi Saitoh, MD, DMSc[2]

[1]Faculty of Rehabilitation, School of Health Sciences, Fujita Health University, Toyoake, Aichi, Japan
[2]Department of Rehabilitation Medicine I, School of Medicine, Fujita Health University, Toyoake, Aichi, Japan
[3]Faculty of Nursing, School of Health Sciences, Fujita Health University, Toyoake, Aichi, Japan

ABSTRACT
Ozeki M, Kagaya H, Shibata S, Onogi K, Sugiyama T, Saitoh E. Transanal irrigation for bowel dysfunction in chronic stage of spinal cord-injured patients. Jpn J Compr Rehabil Sci 2019; 10: 9–13.
Objective: To investigate the efficacy of transanal irrigation (TAI) for patients with spinal cord injury who experience subjective symptoms, such as abdominal distension, due to constipation that has not been well managed.
Methods: An irrigation kit was used to perform TAI on 8 patients with spinal cord injury (mean age, 44 years). The patients had the following injury sites: cervical spinal cord (2 patients), thoracic spinal cord (4 patients), lumbar spinal cord (1 patient), and sacral spinal cord (1 patient). Before and after the irrigation procedure, we assessed the time spent on defecation, time interval between defecations, constipation, diarrhea, fecal incontinence, defecation management methods, and defecation status using a visual analogue scale (VAS). At the last follow-up, we examined the usage of irrigation, constipation, diarrhea, fecal incontinence, and defecation management methods.
Results: Irrigation was possible for all patients included in this study. No changes were observed in the time spent on defecation or the interval between defecations. However, we did observe a significant decrease in constipation and a significant improvement in VAS after the irrigation procedure. Four patients were continuing the use of irrigation at the last follow-up. Including the 2 patients who discontinued irrigation because their defecation management improved, satisfactory results were observed in 6 patients.
Conclusion: Irrigation using an irrigation kit was effective for bowel dysfunction in patients with spinal cord injury.
Key words: spinal cord injury, bowel dysfunction, irrigation, constipation, fecal incontinence

Introduction

Bowel dysfunction in the form of constipation and fecal incontinence causes a greater decline in the quality of life (QOL) of patients with spinal cord injury than urinary dysfunction or sexual dysfunction because it adds significant time, physical, and mental burdens to the patient's life [1–3]. In many cases, bowel dysfunction cannot be fully managed through a regular diet; fluid intake; the establishment of regular defecation habits; the use of laxatives, suppositories, or enema; or fecal disimpaction alone. Chronic constipation causes poor appetite due to the sensation of abdominal bloating and repetitive diarrhea from large doses of laxatives. Disimpaction of hardened feces runs the risk of injuring the rectal mucosa. Odor and hygiene are also major problems associated with fecal incontinence. However, because bowel dysfunction is almost completely unrelated to vital prognosis, this problem is not being actively treated or studied.

Chronic constipation in patients with spinal cord injury is caused by dysfunction of the descending colon distal to the splenic flexure, the sigmoid colon, and the rectum; therefore, feces pass normally through the intestines up to the splenic flexure [4–6]. Thus, if feces that are impacted in the rectum are removed regularly (every 2–3 days), marked delay of the transport of feces through the large intestine is not observed [7]. Irrigation is a commonly used method to remove impacted feces from the rectums of patients with spinal cord injury. When irrigation is used in conjunction with conventional defecation control measures, impacted fecal matter can be regularly

Correspondence: Megumi Ozeki, MD, DMSc
Faculty of Rehabilitation, School of Health Sciences, Fujita Health University, 1–98 Dengakugakubo, Kutsukake, Toyoake, Aichi 470–1192, Japan.
E-mail: megnagae@fujita-hu.ac.jp
Received: August 21, 2018; Accepted: December 11, 2018.
There is no conflict of interest in this study.

doi.org/10.11336/jjcrs.10.9

removed. This allows fecal matter to pass through the large intestine more smoothly, which improves bowel dysfunction. Malone antegrade continence enema (MACE) [8−11] entails connecting the vermiform appendix to an opening in the abdominal wall. Consequently, antegrade irrigation can be performed by injecting irrigation fluid through this opening. Although feces are expelled following the same route as physiological intestinal circulation, this procedure is surgically invasive and is associated with problems, such as stenosis of the fistula and reflux through the fistula. As a result, transanal irrigation (TAI) is often utilized in unresponsive cases. There are several different procedures for TAI, which is a retrograde irrigation technique. The enema continence catheter (ECC) [8] method involves inserting a catheter into the anus and injecting tepid fluid into the rectum to induce defecation. Because the catheter is fixed within the rectum using a balloon, the procedure can be performed with minimal insertion-related manipulation. However, problems associated with this procedure include the fact that small amounts of hemorrhage in the rectum can occur, manipulation of the device requires assistance, fluid can leak from the site of catheter insertion and cause contamination, and the catheter can be expelled through the rectum during manipulation. Pulsed irrigation enhanced evacuation (PIEE)[12−14] involves the use of a tube for recovering the fluid, which increases the hygiene of the procedure by reducing fluid leakage. This procedure is easy to perform because the amount of fluid and the speed at which it is injected can be adjusted. However, it requires a large device and a full understanding of the operating procedure. The Peristeen anal irrigation system involves fixing a catheter within the rectum using a balloon; this system can be manipulated by a single person. A randomized controlled trial of the use of the Peristeen anal irrigation system on patients with spinal cord injury reported that compared to conservative treatment methods, TAI led to improvements in constipation, fecal incontinence, and QOL [15]. In addition to neurogenic intestinal dysfunctions, such as spinal cord injury, spina bifida, and multiple sclerosis, TAI is also indicated for fecal incontinence, disorders of fecal mobility, and post-lower anterior resection syndrome. However, TAI is contraindicated for anal and intestinal stenosis and for use during the active phase of intestinal inflammatory diseases, acute diverticulitis, and colorectal cancer. Perforation is the primary complication associated with TAI, but this occurs extremely rarely (0.0002%) [16]. Although the equipment required for TAI is expensive, its use lowers nursing care and urinary tract infection-related costs, and thus, the overall cost of TAI is comparatively low [17].

In the present study, we utilized the procedure developed by Miyazaki et al. [18, 19], which is simple and minimally invasive using a simple intestinal irrigation kit. Here we report on the results obtained from its use in patients with chronic stage of spinal cord injury, whose bowel movement was not well managed.

Methods

We introduced an irrigation method using an intestinal irrigation set in 8 patients who complained of subjective symptoms, such as abdominal bloating with more than 4 days without defecation per time for at least one month, and whose defecation control was unsatisfactory despite defecation management by using laxatives, suppositories, enema, or disimpaction. Seven men and 1 woman with a mean age of 44 years (24−70 years) comprised the study population. Their primary illnesses were traumatic spinal cord injury (4 patients), radiation myelopathy (1 patient), epidural hematoma of the thoracic spinal cord (1 patient), myelitis (1 patient), and thoracic aortic aneurysm (1 patient). The injury sites were as follows: cervical spine (2 patients), thoracic spine (4 patients), lumbar spine (1 patient), and sacral spine (1 patient). The American Spinal Injury Association classifications were as follows: A in 4 patients, B in 2 patients, and D in 2 patients. The 2 cervical injury cases required nursing care for their defecation management. The mean period between the onset and the start of intestinal irrigation was 26 months (7−68 months) (Table 1). We utilized the Phycon Intestinal Irrigation Set (Fuji Systems Corporation) (Figure 1). This irrigation system involves injecting between 50 and 100 ml of tepid fluid using a catheter via the anus into the rectum, removing the catheter, and then expelling the fluid and feces. Repeating this process dozens of times results in the complete expulsion of all fecal matter. Intestinal irrigation was performed during hospitalization once every 2−3 days in accordance with each patient's defecation cycle. Each patient received guidance between 5 and 7 times during their hospital stay.

Table 1. Patient characteristics.

Case	Age	Sex	Functional level	AIS	Time after onset (months)
1	59	M	C6	B	39
2	24	M	C7	B	68
3	53	M	Th5	A	7
4	34	M	Th6	A	13
5	39	M	Th9	A	14
6	45	F	Th10	A	12
7	27	M	L4	D	44
8	70	M	S1	D	12

AIS, ASIA impairment scale.

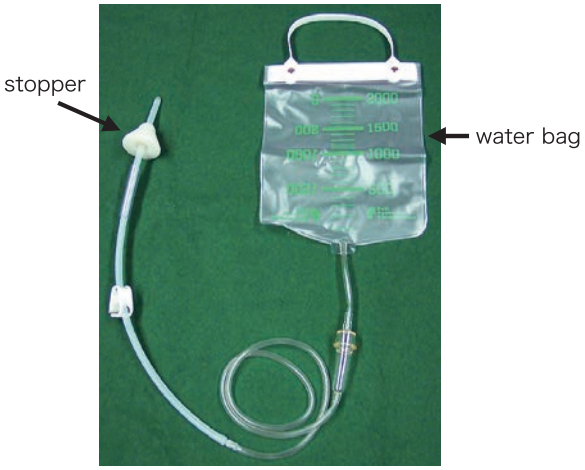

Figure 1. Phycon Intestinal Irrigation Set (Fuji Systems Corporation).
An easy-to-use transanal irrigation kit.

We measured the following data items by questioning the patients one month prior to irrigation and again one month after discharge following the completion of irrigation: time required for defecation, time intervals between defecations, constipation, diarrhea, fecal incontinence, and defecation management methods used other than irrigation. Defecation status before and after irrigation was measured by asking the following question: "On a scale of 0−100, where the worst defecation status is 0 and the best is 100, how would you score your defecation status over the past month?" The patients evaluated their status by themselves using a visual analogue scale (VAS). Constipation was defined as at least 4 days without defecating and the presence of subjective symptoms, such as the feeling of abdominal bloating, while fecal incontinence was defined as fecal leakage when not undergoing treatment. We also questioned the patients regarding the mean amount of tepid fluid used in irrigation one month following discharge after completing the in-hospital irrigation procedure. Furthermore, at the last follow-up, we assessed whether the patients were still using the irrigation method, the presence or absence of constipation, diarrhea, fecal incontinence, and the methods of defecation management.

Statistical analyses were conducted using the Wilcoxon signed-rank test to assess the time required for defecation and the intervals between defecations. The paired *t*-test was used to assess the VAS. We compared patient status at pre-irrigation, post-irrigation, and the last follow-up using McNemar's test for constipation, fecal incontinence, and defecation management methods (laxatives, suppositories, enema, and disimpaction). The level of significance was set at 5%. The statistical analyses were performed using JMP version 12 (SAS Institute, Inc., Cary, NC).

Results

The introduction of irrigation was completed in all patients within 2 weeks. The 2 patients with cervical spine injury required continued assistance with irrigation, but all other patients were able to perform irrigation on their own. The amount of tepid irrigation fluid utilized was 2.9 ± 2.6 L (mean ± SD). The median time required for defecation was 27.5 minutes pre-irrigation and 60 min post-irrigation, indicating that the time required increased; however, this increase was not statistically significant. The median interval between defecations was 3 days both pre- and post-irrigation, indicating no statistically significant difference. All patients had constipation prior to irrigation, but there was a significant decrease at post-irrigation in the patients suffering from constipation (p=0.046). Although 1 patient complained of diarrhea prior to irrigation, no patients had diarrhea after irrigation. The number of patients with fecal incontinence also decreased from 5 to 3, but this decrease was not statistically significant. An analysis of the method of defecation management indicated that the number of patients using laxatives decreased from 7 to 6, the number using suppositories decreased from 3 to 1, the number using enema decreased from 3 to 2, and the number using disimpaction decreased from 5 to 2. However, these decreases were not statistically significant. After introduction of irrigation, the patients who used suppositories or enema performed irrigation immediately after using suppositories or enema and then used disimpaction if any fecal matter remained. No patients used both suppositories and enema concomitantly after the introduction of irrigation. VAS improved in all cases. The mean score was 31 points pre-irrigation and 71 points post-irrigation, indicating significant improvement (p<0.001) (Table 2). After the initial irrigation, case 3 experienced abdominal pain, and case 5 experienced anal hemorrhage as complications, but these symptoms improved after completion of the introduction of irrigation; no recurrence of symptoms was observed thereafter.

The median follow-up period was 39.5 months. No serious complications were observed at the last follow-up. Four patients discontinued irrigation at the last follow-up, but 2 of them did not have to use it because of good defecation control; case 1 used laxatives and enema, while case 6 laxatives alone. Therefore, cases 1−6 were able to control their defecation cycle, but cases 7 and 8, who experienced spinal cord injury in the lower segments, were unable to achieve good control and they discontinued irrigation. Constipation was observed in only 1 patient at the last follow-up, which was a significant decrease compared to pre-irrigation (p=0.008). Fecal incontinence was also observed in only 1 patient, indicating a significant

Table 2. Comparison between pre and post transanal irrigation.

Case	Time required for defecation (min)		Interval between defecations (days)		Constipation		Diarrhea		Fecal incontinence		Defecation management								Visual analog scale	
											Pre				Post					
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Laxative	Suppository	Enema	Disimpaction	Laxative	Suppository	Enema	Disimpaction	Pre	Post
1	60	60	2.5	3	+	−	−	−	+	−	+	+	−	−	+	−	+	−	50	80
2	90	60	7	4	+	−	−	−	−	−	+	+	+	+	−	−	−	−	40	99
3	10	90	1	2.5	+	+	−	−	+	+	+	−	−	+	+	−	+	−	70	80
4	10	100	2.5	3	+	+	+	−	+	+	−	−	−	+	−	+	−	+	50	80
5	60	60	3	5.5	+	+	−	−	+	−	+	−	−	−	+	−	−	−	0	30
6	10	10	3	3	+	−	−	−	−	−	+	−	+	+	+	−	−	−	40	90
7	45	60	4	3	+	+	−	−	+	+	+	+	+	−	+	−	−	−	0	60
8	10	30	3	2.5	+	−	−	−	−	−	+	−	−	+	+	−	−	+	0	50

Table 3. Last follow-up.

Case	Follow-up period (months)	Use of transanal irrigation	Constipation	Diarrhea	Fecal incontinence	Defecation management			
						Laxative	Suppository	Enema	Disimpaction
1	34	−	−	−	−	+	−	+	−
2	53	+	−	−	−	+	−	+	−
3	48	+	−	−	−	+	−	−	−
4	45	+	−	−	−	+	−	−	−
5	48	+	−	−	−	−	−	−	−
6	34	−	−	−	−	+	−	−	−
7	24	−	−	−	+	+	−	−	−
8	15	−	+	−	−	+	−	+	+

post-irrigation decrease (p=0.046). No patients complained of diarrhea. No patients used suppositories, and only 1 patient used disimpaction, indicating a significant decrease at the last follow-up (p=0.046) (Table 3).

Discussion

In this study, we found that the use of irrigation led to significant improvement in VAS scores and significant decreases in constipation. At the last follow-up, fecal incontinence and the use of disimpaction also significantly decreased. Good outcomes were obtained in 6 out of 8 patients, including 2 patients in whom irrigation was discontinued because satisfactory defecation control was achieved. Therefore, we assume that irrigation contributes to improved QOL in patients with spinal cord injury. In particular, the number of patients who utilized disimpaction, which often leads to injury of the rectal mucosa, decreased from 5 patients prior to the introduction of irrigation to only 1 patient at the last follow-up. We believe this result is highly significant. No change was observed in the time required for defecation and the interval between defecations, and at the last follow-up, 6 patients, excluding the 2 whose injury was located in the lower segments of the spinal cord, were able to self-manage their defecation cycle; 4 of those patients were continuing to use irrigation. Irrigation provides stimulus to the anus and rectum through the use of the catheter: the injected fluid dilates and stimulates the rectum, and moisture is added to the hardened feces, all of which promote defecation. Because irrigation utilizes the body's natural defecation response, we believe it is better tolerated than intestine-stimulating laxatives. TAI led to improvement in constipation in 60% of patients and fecal incontinence in 67% of patients who suffered from spinal cord injury or cauda equina injury and who underwent ECC [8]. Moreover, it has been reported that the use of the Peristeen anal irrigation system led to significantly better improvement in constipation and fecal incontinence than conventional defecation management techniques [17]. The Peristeen anal irrigation system has recently been utilized in Japan. A prospective multi-institutional study of its use in intractable bowel dysfunction is being conducted, and the short-term results have already been published. The VAS of 25 patients who utilized the system for over 10 weeks showed the same significant improvements as that in the present study. However, in 3 patients (9.4%), large bowel perforation occurred, which was a notably higher percentage than those indicated in past reports. Large bowel perforation in 2 out of 3 patients was ostensibly due to over-dilation of the balloon, which is a serious complication; therefore, this issue requires further study [20]. The system we utilized uses a stopper instead of a balloon, and consequently, large bowel perforation cannot occur due to over-dilation of the balloon. There have been no reports of large bowel perforation in studies using the same system [18, 19], but because large bowel perforation is a serious complication, continued care is required.

In a longer-term study, the use of TAI was found to have been discontinued by half the subjects after 3 years [16]. In the present study, 4 of 8 patients had discontinued the use of TAI at the last follow-up. However, 2 of the patients who discontinued irrigation did so because their constipation and fecal incontinence disappeared and they were able to self-manage their defecation cycle. Thus, the introduction of irrigation was successful in these patients. The 2 patients with spinal cord injuries in the lower segments discontinued irrigation because they could not achieve sufficient defecation control. However, because few patients were included in this study, we were unable to identify whether the effectiveness of irrigation was dependent on the level of spinal cord injury. Therefore, this issue requires further study. One major limitation of this study was the fact that the data were primarily collected through interviews with the patients. To reach a clearer conclusion, an objective assessment with larger numbers of patients is needed. The system utilized in this study is no longer commercially available, and serious complications associated with the Peristeen anal irrigation system have been reported in Japan. However, a safe irrigation system is effective when used in patients with spinal cord injury who find it difficult to achieve defecation control. Thus, we look forward to the development of safer and more effective irrigation equipment.

References

1. Stiens SA, Bergman SB, Goetz LL. Neurogenic bowel dysfunction after spinal cord injury: clinical evaluation and rehabilitative management. Arch Phys Med Rehabil 1997; 78: S86–102.
2. Krogh K, Nielsen J, Djurhuus JC, Mosdal C, Sabroe S, Laurberg S. Colorectal function in patients with spinal cord lesions. Dis Colon Rectum 1997; 40: 1233–9.
3. Benevento BT, Sipski ML. Neurogenic bladder, neurogenic bowel, and sexual dysfunction in people with spinal cord injury. Phys Ther 2002; 82: 601–12.
4. Menardo G, Bausano G, Corazziari E, Fazio A, Marangi A, Genta V, et al. Large-bowel transit in paraplegic patients. Dis Colon Rectum 1987; 30: 924–8.
5. Nino-Murica M, Stone JM, Chang PJ, Perkash I. Colonic transit in spinal cord-injured patients. Invest Radiol 1990; 25: 109–12.
6. Keshavarzian A, Barnes WE, Bruninga K, Nemchausky B, Mermall H, Bushnell D. Delayed colonic transit in spinal cord-injured patients measured by indium-111 Amberlite scintigraphy. Am J Gastroenterol 1995; 90: 1295–300.
7. Miyazaki K, Ishido T, Takasaka S, Fujii N. Colorectal movement and effect of colonic washout methods by using $BaSO_4$ in patients with spinal cord lesions. J Jpn Med Soc Paraplegia 1990; 3: 330–1. Japanese.
8. Christensen P, Kvitzau B, Krogh K, Buntzen S, Laurberg S. Neurogenic colorectal dysfunction — use of new antegrade and retrograde colonic wash-out methods. Spinal Cord 2000; 38; 255–61.
9. Teichman JM, Harris JM, Currie DM, Barber DB. Malone antegrade continence enema for adults with neurogenic bowel disease. J Urol 1998; 160: 1278–81.
10. Hinds AC, Baskin LS. The new Malone antegrade continence enema automatic instillation device allows independence and decreases flush times. J Urol 2004; 172: 1681–5.
11. Defoor W, Minevich E, Reddy P, Barqawi A, Kitchens D, Sheldon C, et al. Perforation of Malone antegrade continence enema: diagnosis and management. J Urol 2005; 174: 1644–6.
12. Puet TA, Phen L, Hurst DL. Pulsed irrigation enhanced evacuation: new method for treating fecal impaction. Arch Phys Med Rehabil 1991; 72: 935–6.
13. Puet TA, Jackson H, Amy S. Use of pulsed irrigation evacuation in the management of the neuropathic bowel. Spinal Cord 1997; 35: 694–9.
14. Christensen P, Olsen N, Krogh K, Bacher T, Laurberg S. Scintigraphic assessment of retrograde colonic washout in fecal incontinence and constipation. Dis Colon Rectum 2003; 46: 68–76.
15. Christensen P, Bazzocchi G, Coggrave M, Abel R, Hultling C, Krogh K, et al. A randomized, controlled trial of transanal irrigation versus conservative bowel management in spinal cord-injured patients. Gastroenterology 2006; 131: 738–47.
16. Emmanuel AV, Krogh K, Bazzocchi G, Leroi AM, Bremers A, Leder D, et al. Consensus review of best practice of transanal irrigation in adults. Spinal Cord 2013; 51: 732–8.
17. Christensen P, Andreasen J, Ehlers L. Cost-effectiveness of transanal irrigation versus conservative bowel management for spinal cord injury patients. Spinal Cord 2009; 47: 138–43.
18. Miyazaki K, Suzuki Y, Ishidou T. Current study about vesicorectal dysfunction. Sogo Rihabiriteshon 1988; 16: 39–43. Japanese.
19. Miyazaki K, Ishidou T, Takasaka S, Fujii N. Development and clinical outcome of intermittent irrigation system for chronic constipation and incontinence in patients with spinal cord injury and spina bifida. J Jpn Med Soc Paraplegia 1990; 3: 276–7. Japanese.
20. Mimura T, Tsunoda A, Sengoku A, Katsuno H, Takao Y, Kimoto Y, et al. Transanal irrigation for refractory disordered defecation: a prospective multicenter clinical study in Japan. J Jpn Soc Coloproctol 2018; 71: 70–85. Japanese.