

An Angled Stick Colonic Irrigation Device for the Bowel Management Programs in Patients with Impaired Bowel Function

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Abstract

Objective: Retrograde colonic irrigation is a treatment of choice for severe defecation disorders accompanied by congenital disorders such as anal malformations and spina bifida; however, it requires skills, effort and enough space. With the aim of making retrograde colonic irrigation easier and comfortable, we made a self-help colonic irrigation device applicable for these patients.

Methods: An angled stick colonic irrigation device was made for comfortable retrograde colonic irrigation. Angulated handle colonic irrigation system was trialed by seven preschool and school age patients including four patients with spina bifida and three patients with congenital ano-rectal anomaly.

Results: Four out of seven patients operated the angulated handle colonic irrigator well. The colonic irrigation device enabled the patients with severe defecation disorders to hold the cone tip securely in place and prevented backflow and contamination.

Conclusion: The angulated handle colonic irrigator may help retrograde colonic irrigation more comfortable and easier in selected patients with spina bifida or ano-rectal malformations.

Keywords: Colonic irrigation; Constipation; Incontinence; Ano-rectal malformations; Spina bifida; Children; Device

Introduction

Several management options are available for the bowel management of the patients with spina bifida or congenital ano-rectal anomalies. Socially acceptable continence and prevention of fecal impaction are the goal of the bowel management. A large proportion of the patients with spina bifida have hyper-reflexic bowel and flaccid external anal sphincter, which may result in fecal incontinence [1]. A bowel evacuation on a regular schedule is satisfactory for these patients; however, it needs effort, time and good help to achieve. Glycerin enema or colonic irrigation is not successful in evacuation because the fluid runs out from the anus. Furthermore, ordinary colonic irrigation system with a cone tip requires a strong hand to secure it properly on the anus; otherwise, the hand may be contaminated by backflow. Aiming at improving bowel management of these patients, an angulated handle colonic irrigator was designed.

Materials and Methods

Angulated handle colonic irrigator

Two prototypes were made (Figure 1). Prototype I was made by hand using a polyvinyl tube. Prototype I was easy to operate, but the assembly and hygienic maintenance were difficult. Prototype II consists of three parts: the pedestal, the body and the handle. The pedestal and handle are screwed into the body of the device. The colonic irrigation set is composed of the irrigation fluid bag, the drip chamber, and the infusion tube. The infusion tube, made of polyvinyl chloride, is connected to the silicone cone through the pedestal. The cone tip is made of silicone and fixed securely on the pedestal. The system is latex-free. Because the pedestal, handle and body are separable, they can be packed in a cosmetic pouch sized bag.

Colonic irrigation

An irrigation solution was made by adding 1 gram of salt (Sodium

Chloride) to lukewarm tap water. The irrigation bag was suspended at approximately shoulder height. After lubrication, the cone tip was inserted and held securely in the anal canal by the handle. The irrigation solution was then infused until the patient feel fullness or mild abdominal discomfort. Then, the anus was unplugged by retracting the handle toward the patient. The contents were evacuated as soon as the cone was detached from the anus. The volume required for one wash differed from one patient to another.

Patients

Seven patients tested the angulated handle colonic irrigation. Four patients had spina bifida and three patients had ano-rectal malformation (Table 1). Case 1, a boy aged 8 years, had no apparent paralysis in his lower extremities. Case 2, a girl aged 18 years, could walk alone with mild weakness of the leg. The other two boys aged 12 (case 3) and 14 years old (case 4), respectively, had weakness of their lower extremities and could not walk without braces. Their ano-rectal function tests showed hyperactive rectum, loss of sensation in the perineum, and diminished sphincter function of the anus. Case 5, 6 and 7 had severe constipation since infantile period after the surgical repair for their congenital ano-rectal diseases.

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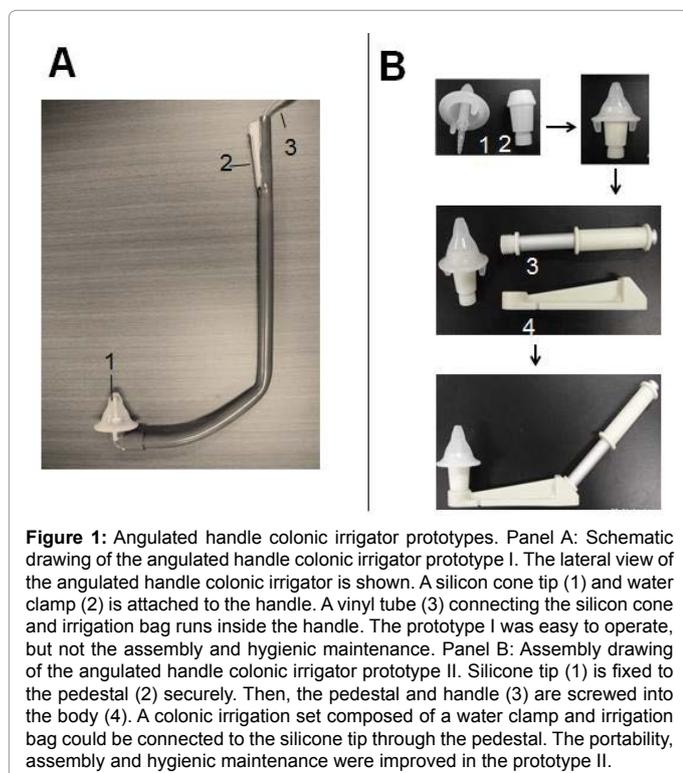
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| No. | Age (years) | Sex | Diagnosis | Neurological level (The most caudal segment with normal function) | | | Brace | Use of wheel chair for community mobility | Anorectal functions | Major problem in bowel control | |
|-----|-------------|-----|--|---|---------|-------|------------|---|--|--------------------------------|--------------|
| | | | | Tethering | Sensory | Motor | | | | Incontinence | Constipation |
| 1 | 8 | M | Lumbosacral meningomyelocele | yes | S4-5 | S1 | none | no | Hyperactive rectum, Flaccid anus | yes | yes |
| 2 | 12 | M | Lumbosacral meningomyelocele | yes | S2 | L3 | ankle foot | yes | Hyperactive rectum, Flaccid anus | yes | yes |
| 3 | 16 | M | Lumbosacral meningomyelocele | yes | L5 | L3 | ankle foot | yes | Hyperactive rectum, Flaccid anus | yes | no |
| 4 | 18 | F | Lumbosacral meningomyelocele | yes | S3 | L4 | none | no | Hyperactive rectum, Flaccid anus | yes | no |
| 5 | 9 | M | Anal agenesis (post-anoplasty) | no | — | — | — | no | Nointernal anal sphincteric activity on manometric study | yes | yes |
| 6 | 5 | M | Rectourethral fistula (post-anoplasty) | no | — | — | — | no | Diminished internal anal shincteric activity on manometric study, tight anal canal | yes | yes |
| 7 | 15 | F | Hirschsprung's disease (Treated with modified Duhamel's procedure) | no | — | — | — | no | No rectoanal reflex | no | yes |

Table 1: Clinical characteristics of the patients who tried the angulated handle colonic irrigator. Ethical aspects.



The patients and their parents need to be well-informed about the study. The procedures of the colonic irrigation were conducted after obtaining informed consent from the patients and their parents. The study was approved by the Ethics Committee of Akita University Graduate School of Medicine (Approval No 334) and Hirosaki University Graduate School of Medicine (Approval No 2013-113).

Results

The total amount of irrigation solution and time required for one course of irrigation ranged from 1 to 6 liters and 15 to 60 minutes, respectively. With the aid of the principles of lever (Figure 2), backflow could be prevented if the cone tip was fixed securely in the appropriate position during infusion. Case 1 and 2 could adjust the position of the cone tip appropriately. A boy aged 16 years could not fix the cone tip because of the obesity and poor control of the body position. A girl, aged 18 years suffering from accidental incontinence in daily life, could operate the device, but she preferred manual extraction and sanitary napkins to colonic irrigation. Case 5, 6 and 7 had no difficulty in the operation of the device. Case 6 and 7 had improvement in their bowel control, but case five preferred colonic irrigation by his parents to the angulated handle irrigator.

Discussion

Since bowel dysfunction is a major source of morbidity in individuals with spina bifida and congenital anal malformations, good bowel management is essential in their daily life [1,2]. The bowel management is a time burden for their family too [3]. Retrograde colonic enema is a common choice for bowel management in the patients with spina bifida [4,5]. Accentuated recto-anal reflex and paralytic external anal sphincter cause fecal incontinences. The hyperactivity of the rectum, prolonged recto-anal inhibitory reflex [6], decreased anal resting pressure [7], and diminished rectal sensation [8] are reported in spina bifida. Because the patients with congenital anal malformations have under-developed anatomical structures required for bowel controls, bowel management is a long and hard work for these patients. As it was shown in this study, the angulated handle colonic irrigator was applicable for limited number of patients. The patients accompanying severe motor dysfunction of the trunk and lower extremities could not keep their position on the commode. Furthermore, extensive loss of sensation beyond perianal region makes the patients hard to find

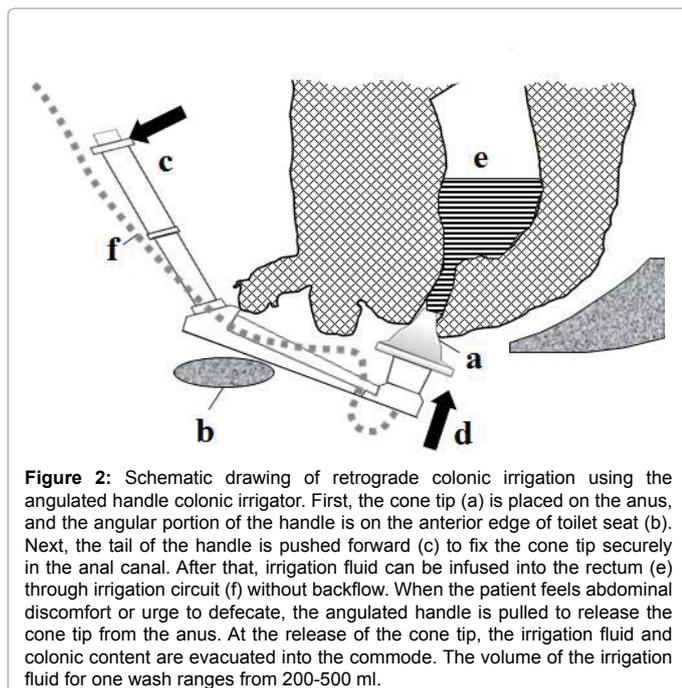


Figure 2: Schematic drawing of retrograde colonic irrigation using the angulated handle colonic irrigator. First, the cone tip (a) is placed on the anus, and the angular portion of the handle is on the anterior edge of toilet seat (b). Next, the tail of the handle is pushed forward (c) to fix the cone tip securely in the anal canal. After that, irrigation fluid can be infused into the rectum (e) through irrigation circuit (f) without backflow. When the patient feels abdominal discomfort or urge to defecate, the angulated handle is pulled to release the cone tip from the anus. At the release of the cone tip, the irrigation fluid and colonic content are evacuated into the commode. The volume of the irrigation fluid for one wash ranges from 200-500 ml.

the anus by themselves. As a result, only the patients of spina bifida with a limited loss of motor and sensational functions could handle the irrigator. The patients treated for ano-rectal anomalies, on the other hand, had no motor and sensational loss in their lower half of the body, and could use the irrigator well. The angulated handle colonic irrigator could help only the selected patients; however, it required less effort, help and time than a simple cone tip. This device could widen the choice for bowel management techniques in patients with spina bifida and congenital ano-rectal diseases; however, not every patient may accept this system.

Conclusion

The stick colonic irrigator was applicable only to selected cases. Nonetheless, the stick colonic irrigator may facilitate in some of the patients with congenital diseases such as spina bifida and ano-rectal malformations to learn bowel managements by themselves.

Acknowledgement

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