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Neurogenic Bowel Dysfunction in Patients with Neurogenic Bladder

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Abstract

Patients with primary neurologic conditions often experience urinary and bowel dysfunction due to loss of sensory and/or motor control. Neurogenic bowel dysfunction is frequently characterized by both constipation and fecal incontinence. In general, the management of neurogenic bowel dysfunction has been less well studied than bladder dysfunction despite their close association.. It is widely accepted that establishment of a multifaceted bowel regimen is the cornerstone of conservative management. Continuing assessment is necessary to determine need for more invasive interventions. In the clinical setting, the Urologist may be the principle provider addressing bowel concerns in addition to bladder dysfunction, and furthermore, treatment of one often impacts the other. Future directions should include development of follow up and management guidelines that address the comprehensive care of this patient population.

Keywords

Neurogenic Bowel; Neurogenic Bladder; Constipation; Fecal Incontinence; Spinal Cord Injury; Spinal Dysraphism; Myelomeningocele; Multiple Sclerosis

Introduction

Bladder and bowel dysfunction commonly affect patients with neurologic conditions, such as myelomeningocele (MMC), spinal cord injury (SCI), and multiple sclerosis (MS). The

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Compliance with Ethics Guidelines

Conflict of Interests

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bladder and rectum share embryologic origin, have closely related autonomic and somatic innervation, and their voluntary control depends on intact function of complex neural networks (1). Symptoms associated with neurogenic bladder and bowel can lead to significant medical complications and social difficulties with dramatic adverse impact on the patients' quality of life (2). Hospitalization for resultant complications (impaction, megacolon, constipation, volvulus) occurs more than twice as frequently in patients with neurologic disease (3)

Neurogenic bowel dysfunction (NBD) is often characterized by both fecal incontinence and constipation, creating a complex entity for treatment. The pathophysiology of NBD varies with the site and severity of the neurologic lesion. Similar to the effect on bladder function and the phenomenon of detrusor-sphincter dyssynergia (DSD), supraconal upper motor neuron (UMN) injury or dysfunction results in hyperreflexic bowel with increased rectal and sigmoid compliance (4) as well as increased anal sphincter tone, thus promoting stool retention and constipation (5). With preservation of the nerves between the spinal cord and colon, reflex coordination and stool propulsion remain intact. Lower motor neuron syndrome results in areflexic bowel, loss of peristalsis with resultant slower stool propulsion, reduced rectal compliance, and lax anal tone (5), (4). This constellation of factors contributes to both constipation and fecal incontinence.

In comparison to neurogenic bladder dysfunction, there has been limited data on the management of NBD. Cameron et al. recently demonstrated in a mixed cohort of patients with SCI or MS, patients with the most bothersome bowel symptoms also had higher acuity urinary incontinence and lower urinary tract symptoms (2). This finding was supported in a cross-sectional observational study of 291 SCI patients (6), and highlights the importance of addressing bowel dysfunction along with bladder management in the urologic care of this patient population.

In this topic review, we appraised treatment of NBD in patients with comorbid neurogenic bladder dysfunction. Neurogenic bowel dysfunction encompasses a broad spectrum due to the heterogeneity of the neurologic diseases and the effect of these varied pathologies on the bowel. Therefore, our review focused on the more common patient populations, including those with MS, MMC, and SCI.

Review of Literature

In general, the goal of neurogenic bowel management is to accomplish complete evacuation of the rectum on a regular basis, thus reducing the risk of fecal impaction, urgency, and incontinence (1). This may be achieved through a multifaceted approach consisting of conservative, medical and even surgical approaches. Conservative management frequently includes adequate fluid intake, balanced diet, physical activity as appropriate, and a regular bowel routine (7). Oral or rectal pharmacologic therapies may be employed to augment conservative management. However, finding an optimal routine often requires trial and error, and adjunctive measures are often required when conservative management fails. A number of different surgical options will additionally be discussed in a following section.

A recent Cochrane review demonstrated sparse published research on the management of NBD, identifying only 20 randomized trials with generally poor quality evidence and stating that, in general, it is not possible to make recommendations based on this level of evidence (7).

Herein, we performed a MeSH search using the terms “Neurogenic Bowel” in combination with “diet therapy,” “drug therapy,” “surgery,” or “therapy” to identify trials and reviews published between 2006 and 2016. We repeated this search to include “Fecal incontinence” with the above terms in combination with each disease entity: “Spinal dysraphism,” “Spinal cord injury,” or “Multiple sclerosis.” We identified 108 complete manuscripts. Abstracts for all these manuscripts were reviewed by one of the authors. After review of abstracts, papers were excluded for foreign language, lack of abstract available, and for subject pertinence to NBD with 84 articles remaining following exclusion. The data presented below includes the results of this search in combination with review level supplemental studies.

Nonpharmacological approach

Dietary modifications—Generally, high fiber diet is recommended to prevent constipation (8). One small case series (n=11) demonstrated that increasing dietary fiber actually increased colonic transit time in a cohort of SCI patients (9). Despite the widespread recommendation, there is actually very limited data on dietary fiber specifically in the management of NBD.

Anorectal/perianal stimulation—Digital rectal stimulation was studied in small cohort of SCI patients, and is postulated to increase colon motility by acting on preserved anorectal reflexes (10). Timing the performance of the bowel routine with food intake can also take advantage of gastro-colonic and recto-colonic reflexes. However, it may not be well received by parents with young children (i.e. MMC) and does not allow for independence in patients with limited mobility.

Transanal Irrigation—Transanal irrigation (TAI) uses fluid to stimulate the bowel and flush out stool to effectively empty the rectum, and can be used to augment a stepwise bowel management program. A large randomized control trial studying TAI vs conservative management in patients with SCI showed that TAI improved constipation, fecal incontinence, and symptom-related quality of life (11).

TAI has also been studied in other NGB patient populations. TAI resulted in significant improvement in defecation symptoms and QoL scores in pediatric MMC patients (12). In a prospective interventional study of 30 patients with MS, 53% were deemed responders, indicating they had at least 50% improvement in their bowel symptoms with TAI (13).

Despite achievement in continence, retrograde enemas can pose a challenge in MMC patients due to lack of anal sphincter tone, and may require an inflatable device (14). One study in children with NBD found a dropout rate of 16% due to noncompliance or balloon extrusion (15). Peristeen® TAI (Coloplast A/S, Humlebaek, Denmark) is a commonly used irrigation system, composed of a rectal balloon catheter connected to a water pump, that has been studied in the MMC population with improvement in opinion of bowel functionality as

well as patient independence (16). A European randomized control trial on cost-effectiveness of the system showed increased product-related costs, which were outweighed by lower costs for a caretaker, changes/washings, as well as those associated with urinary tract infections (17).

Abdominal Massage—In an uncontrolled clinical study, abdominal massage was found to have positive effects on select aspects of NBD (abdominal distention, fecal incontinence, colonic transit time) in patients with SCI (18). A more recent study using an electromechanical apparatus for abdominal massage in 21 patients with SCI showed ambiguous effects with overall satisfaction and confidence in using the device (19).

Biofeedback retraining—Anorectal biofeedback uses operant conditioning to provide motor and sensory retraining via manometry-guided exercises. Randomized controlled trials on biofeedback in non-neurogenic patients with dyssynergic defecation have been conducted. In a randomized control trial of 99 patients with chronic severe pelvic floor dyssynergia, major improvement was seen in 80% of biofeedback patients vs 22% of laxative-treated patients (20). Another trial in a similar population showed improvements in physiologic characteristics such as balloon expulsion and colonic transit time with biofeedback vs sham feedback and standard therapy (diet, exercise, laxatives) (21).

Biofeedback may also be effective in patients with abnormal anorectal physiology, such as those with SCI. In a case-control study, patients with incomplete SCI had similar significant response to biofeedback compared to functional anorectal disorder-matched controls (22). Biofeedback has also been studied in small cohorts of patients with MS and MMC. In the MS study, biofeedback had a beneficial effect in 38% of the patients, more likely positive response in those with limited disability and non-progressive disease course (23). Another study in children with MMC reported a good clinical response in 50% of patients, with success reliant on rectal sensation and ability to contract the gluteal muscles (24).

Pharmacologic Therapy

Suppositories—Bisacodyl (dulcolax) and glycerin suppositories are commonly used in conservative management of NBD. There have been 3 trials in SCI patients comparing polyethylene glycol (PGB)-based vs hydrogenated vegetable oil based (VOB) bisacodyl suppositories demonstrating decreased bowel care time, time to flatus, and defecation periods in the PGB group (25). With similar challenges to TAI, suppositories can achieve rectal stimulation, but can be difficult to keep in place in patients with lax anal tone (26).

Oral Medications—The stool softener docusate is widely employed in the management of constipation. However, its efficacy has not been shown to be greater than placebo in multiple studies.

Although widely used, oral laxatives have not been comprehensively studied in the neurogenic population. One randomized controlled trial comparing polyethylene glycol vs lactulose in pediatric MMC patients reported higher rates of complete resolution of constipation, bowel frequency, and reduction in encopresis with polyethylene glycol (27).

Prokinetic agents accelerate colonic transit, primarily by promoting high-amplitude propagating contractions (HAPCs). Several studies reported the efficacy of cisapride, a serotonin 5-HT₄ receptor agonist in patients with SCI. However, this drug has since been withdrawn from the market due to adverse cardiotoxic effects.

Prucalopride is a novel selective 5-HT₄ receptor agonist with no cardiac toxicity. Prucalopride improved the average weekly frequency of bowel movements over 4 weeks in a double-blind, placebo-controlled, pilot study (28). Although not studied in the NGB population, prucalopride was approved in Europe and Canada for women with chronic constipation in whom laxatives fail to provide adequate relief. It has not been approved by the Food and Drug Administration for use in the United States.

Neostigmine is a reverse cholinesterase inhibitor that has also been studied in NBD. Significant improvement in total bowel evacuation time with intramuscular neostigmine-glycopyrrolate as compared to placebo was noted in a trial in patients with SCI (29), (30).

Lubiprostone is a bicyclic fatty acid derived from prostaglandin E1 that activates ClC-2 chloride channels on the apical aspect of gastrointestinal epithelial cells, increasing the chloride secretion and therefore the net flux of water into the lumen. Lubiprostone is approved for chronic constipation in adults, Opioid-Induced Constipation (OIC) in adults with chronic, non-cancer pain, and Irritable Bowel Syndrome with Constipation (IBS-C) in women 18 years.

Surgical Interventions

Sacral Neuromodulation—Per American Urologic Association (AUA) guidelines, sacral neuromodulation (SNM) and posterior tibial nerve stimulation (PTNS) are listed as third-line therapy in the management of idiopathic overactive bladder. In non-neurogenic populations, these therapies have also demonstrated benefit in the treatment of fecal incontinence (31), (32). FDA-approved indications for SNM include non-obstructive urinary retention, idiopathic overactive bladder, and chronic fecal incontinence. Therefore, SNM represents an effective treatment for both urinary and bowel dysfunction, and is commonly performed by urologists.

However, SNM for fecal incontinence has been less studied in neurogenic patients. SNM was found to have benefit in patients with incomplete SCI and concomitant pelvic functional disturbances (lower urinary tract symptoms, bowel dysfunction, erectile dysfunction) (33), (34). SNM was also studied in adult MMC patients for management of both fecal and urinary functional disorders, with promising preliminary results (35). With limited data, there was one study in 2 patients with partial SCI and fecal incontinence reporting improvement in fecal incontinence severity index and quality of life scales (36).

One consideration is the limitations of SNM in select patient populations, such as those with MS, who require monitoring of their neurologic disease with spinal MRI, which is contraindicated with a sacral nerve stimulator implant. In addition, in patients with MMC the pelvic and sacral nerves display significant variations and anomalies and standard S3 stimulation may not apply to these patients. In the setting of SCI, heterogeneity exists in the

level and extent of spinal cord injury. Therefore, the sacral nerve stimulation may not be relayed to the spinal cord appropriately.

Antegrade Continence Enema—The Malone Antegrade Continence Enema (MACE) provides a continent conduit on the abdominal wall through which a patient may irrigate the entire colon on a regular basis. Most commonly performed in children, the appendix is used to create the stoma; however, other options include retubularized bowel (ileum or colon), or a cecal button or tube (37). Mobilization of the cecum and ascending colon is often amenable to a laparoscopic approach. The appendix can be imbricated to the cecal serosa to reinforce the valve mechanism. The stoma may be positioned at the umbilicus, utilizing a V-flap. (38)

As mentioned above, a cecostomy button can be placed rather than creation of a stoma. This technique was first described in 1996 (14), and has been most studied in the pediatric MMC population. This approach may be helpful when the appendix is destined to be utilized for a catheterizable stoma for the bladder (39). In a retrospective cohort study of 49 patients who underwent either MACE or cecostomy, there was no significant difference in achievement of fecal continence (40). Both approaches had similar complication rates, but differed in the types of complications: stomal stenosis was the most predominant complication for the MACE vs tube dislodgement for cecostomy.

MACE/cecostomy is commonly performed by pediatric urologists and can be done concomitantly with procedures for bladder dysfunction (bladder augmentation, catheterizable channel creation, artificial urinary sphincter) (41). When bowel and bladder surgical procedures are performed for these indications, this is termed Total Continence Reconstruction (40). Although mostly studied in children, a recent meta-analysis has shown MACE to be an effective long-term treatment option in adults as well (42).

MACE has proven to have significant improvement in fecal incontinence and QOL in pediatric patients with MMC and fecal incontinence (43), (44). Antegrade enemas are also easier for patients and caregivers to perform, and may allow the patient to achieve independence in managing their bowels.

Flushes are commonly performed with large volumes of tap water, but additives such as enemas, GoLYTELY, mineral oil, MiraLAX, and glycerin can augment the routines for those with refractory incontinence (45), (46).

Colostomy—Bowel diversion with colostomy is a final resort option for patients who have exhausted all other treatments. In these patients, colostomy was shown to reduce hospitalizations due to bowel dysfunction as well as improve independence and quality of life (47).

Current Guidelines

Currently, the AUA does not have any guidelines on the management of neurogenic bladder or bowel. The European Association of Urology (EAU) has produced a published guideline

on Neurologic Urinary Tract Dysfunction, which only mentions the subject of bowel dysfunction in regards to history taking (48).

In 2010, the 4th International Consultation on Continence of the International Scientific Committee (ISC) published algorithms on evaluation and management of lower urinary tract symptoms and fecal incontinence of both neurogenic and non-neurogenic origin (49). For neurogenic fecal incontinence, the initial evaluation should include detailed history, physical and neurologic examination, functional and environmental assessments. Initial management involves patient education to set goal of complete defecation on a regular basis, adequate fiber and fluid intake, medications, and assisted devices as needed. Conservative management is the mainstay.

The ISC gives Grade C recommendations (low quality of evidence) for management as follows. Conservative treatments include transanal irrigation and electrical stimulation of sphincter. Surgical management for select patients includes MACE, graciloplasty, artificial sphincter, sacral anterior root stimulation, botulinum toxin, and neuromodulation.

The most extensive guidelines on NBD was published in 2012 by the Multidisciplinary Association of Spinal Cord Injured Professionals (MASCIP) (50). The MASCIP guideline provides extensive information on management of all aspects of NBD. Conservative bowel management programs should be tailored to the type of bowel dysfunction (i.e. reflex bowel vs areflexic bowel). The programs are similar in that they include stimulant laxative and abdominal massage with medications to adjust stool consistency as needed. The regimen for reflex bowel also adds in rectal stimulant suppository/enema, whereas digital removal of feces is often required for areflexic bowel. The specific interventions depend on the patient's mobility, independence, home setting, and personal preference.

The MASCIP Guideline provides a simple pyramid algorithm for NBD management. The bottom two tiers represent conservative management as outlined above. Movement up the pyramid (transanal irrigation, antegrade colonic irrigation (MACE), nerve stimulation, and stoma) is dependent on ongoing assessment and evaluation, and may require referral to specialized centers.

Figure 1: General management algorithm for NGB.

Future direction

Bladder and bowel dysfunctions are commonly experienced by patients with neurologic diseases. The ISC recommendations noted that urinary and bowel function should be looked at together as symptoms and management of one system can influence the other. For example, treatment of urinary incontinence with anticholinergics may exacerbate constipation. Such concomitant bowel impact may promote consideration of alternative therapies for bladder dysfunction, such as intravesical Botulinum toxin, in NGB patients. Overall, the data stresses the importance of a comprehensive approach to the care of patients with neurogenic conditions.

Thus, a multifactorial approach to management of these patients would be ideal. In the future, we encourage identifying the current knowledge gaps, performing prospective research, and collaborating with groups to develop consensus and guidelines that address the management of both bladder and bowel dysfunction.

Conclusions

Patients with neurologic conditions often experience both urinary and bowel dysfunction, which negatively impacts their QOL. The management of bowel dysfunction has been less studied and is quite heterogeneous. In the Urologic community, it is important to address both urinary and bowel dysfunction as treatment of one may affect the other. Evidence-based guidelines would enhance the Urologist's ability to provide multi-faceted care of this complex patient population.

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Figure 1.
Hierarchy of treatments for neurogenic bowel dysfunction