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Experience with Glycerin for Antegrade Continence Enema in Patients with Neurogenic Bowel

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Abstract

Purpose—Malone antegrade continence enemas are used in the management of neurogenic bowel to attain fecal continence. Several different irrigation solutions have been described but glycerin, an osmotic laxative that promotes peristalsis, has rarely been mentioned or studied. We assessed clinical outcomes in our patients with a Malone antegrade continence enema using glycerin based irrigation.

Materials and Methods—We retrospectively reviewed patients with neurogenic bowel who underwent a Malone antegrade continence enema procedure between 1997 and 2011. Glycerin diluted with tap water followed by a tap water flush is our preferred irrigation protocol. Bowel regimen outcomes examined included fecal continence, emptying time, leakage from stoma, enema volume, frequency and independence.

Results—Of the 23 patients with followup greater than 6 months 19 used glycerin based irrigation. Average age at surgery was 8.8 years. Patients using glycerin instilled a median of 30 ml (mean 29) glycerin and 50 ml (131) tap water. Fecal continence rate was 95% and stoma leakage rate was 16%, and only 16% of patients required daily irrigation.

Conclusions—Glycerin is a viable and effective alternative irrigant for antegrade enemas of neurogenic bowel, with an excellent fecal continence rate. The volume of irrigant needed is typically less than 90 ml, which is much less than in published reports using tap water alone.

Keywords

enema; fecal incontinence; glycerol; neurogenic bowel; spinal dysraphism

The antegrade continence enema operation was first described by Malone et al in 1990.¹ The procedure is commonly performed in children with neurogenic bowel who suffer from severe, chronic constipation or fecal incontinence. The procedure works by enabling the antegrade instillation of fluid into the proximal colon to achieve a complete and prompt evacuation of stool that may not be possible with either a retrograde enema or oral regimen. The procedure generally entails taking a small segment of intestine, typically the appendix,

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Study received institutional review board approval.

and bringing it up to a skin level stoma in a nonrefluxing manner. The patient or caregiver can then insert a catheter through the stoma into the large intestine and flush in an irrigant solution every 1 to 3 days. Since the initial report, multiple refinements in the technique have been proposed, with partial or complete continence rates ranging between 57% and 100%.^{2–10}

A variety of different irrigant solutions have been described in MACE, including saline, tap water, polyethylene glycol and mineral oil. However, glycerin has rarely been mentioned as a possible irrigant, and we are unaware of any recent studies regarding its clinical efficacy and outcomes.⁶ Glycerin acts as an osmotic laxative that promotes water absorption in the colon, thereby stimulating peristalsis. This action was confirmed in 1 study using fluoroscopic defecography that revealed glycerin enemas in patients with MACE evoked cecal peristalsis that was transmitted completely along the colon to the rectum.¹¹ Compared to reported outcomes with tap water irrigation, we have found that glycerin requires less overall volume, potentially allowing more patient independence from their adult caregivers, greater ease of delivering the enema, decreased time to perform the enema and improved continence rates. We describe patient outcomes at our institution with glycerin based irrigation following MACE procedures.

MATERIALS AND METHODS

Chart Review

After obtaining approval from our institutional review board we retrospectively reviewed pediatric urology surgical case logs at our institution from September 1997 to August 2011 to identify individuals who had undergone MACE procedures and had at least 6 months of followup available, defined as number of months from date of operation until most recent outpatient clinic appointment. We excluded patients who had undergone cecostomy (Chait) tube placement to obtain a homogeneous MACE only cohort.

Patients followed our standard protocol for MACE irrigation, which starts with 30 ml glycerin diluted with 30 ml tap water in a single 60 ml syringe, followed by a flush of 30 ml tap water. Irrigation is initiated on a daily basis and then spaced to every 2 or 3 days as success allows. If cramping is problematic, volume is decreased. If continued fecal incontinence or prolonged emptying time is problematic, irrigant volume is increased.

Bowel regimen outcomes included fecal continence per anus (continence vs incontinence), time to perform the enema (irrigation plus emptying time, continuous variable), leakage from stoma (any leak vs no leak), enema volume (continuous), enema frequency (daily vs less frequently) and enema independence (independent vs dependent on caregiver). Outcomes were determined from most recent clinic notes. Fecal continence was defined as no stool in undergarments except on rare occasions when the patient was off the regular routine or had gastrointestinal illness. At each clinic visit the physician obtained all clinical information, including continence, from the caregivers unless the patient was independent enough to be seen at the clinic alone. This approach allowed more pointed questioning and clarification of what the patient may refer to as “accidents.”

Statistical Analysis

We analyzed outcomes using standard mean, median and range descriptive statistics. Statistical analysis was performed with STATA®, version 11.

RESULTS

A total of 23 patients with a neurogenic bladder who underwent a MACE procedure and fit the inclusion criteria were identified from the surgical logs. Four patients relied on tap water only irrigation due to inability to tolerate glycerin based irrigation because of excessive cramping. Of the remaining 19 patients 16 had spina bifida (myelomeningocele or lipomeningocele), 2 had undefined neuropathy and 1 had cerebral palsy.

Gender distribution was equivalent between the groups (see table). Patient age at surgery ranged from 5 to 22 years. Range of followup was 6 to 107 months (mean 39, median 32) from the date of the procedure. Median glycerin volume required was 30 ml, with only 4 patients using more than this amount. Median tap water volume required in addition to glycerin was 50 ml, with only 5 patients using more than 60 ml.

The patients in our cohort had high fecal continence rates (95%) and most (83%) did not require daily irrigation. Evacuation occurred within 1 hour of enema administration for all patients. Three patients (16%) reported occasional leakage from the stoma, which usually occurred when they were constipated. These episodes typically resolved with temporary, more aggressive flush regimens, such as higher volume or daily flushes.

We performed a sensitivity analysis separating patients into those who used less than 60 ml tap water flush following glycerin administration and those who used 60 ml or more. Patients using less than 60 ml flush were 100% continent (11 of 11) compared to 88% of patients (7 of 8) using 60 ml or more.

No complications related to bowel irrigation were noted. Serum chemistry tests were performed on an annual basis, and no abnormalities due to irrigation regimen were noted.

DISCUSSION

Individuals with neurogenic bowel and their caregivers often face difficulty in managing chronic constipation and/or fecal incontinence. The MACE technique offers the ability to eliminate constipation and markedly decrease incontinence. This procedure has been shown to improve quality of life and psychosocial parameters not only for patients but also for family caregivers.^{7,12,13}

We evaluated clinical outcomes using a low volume glycerin based solution as an irrigant for MACE channels and observed it to be highly successful. Glycerin is an osmotic laxative that promotes peristalsis by increasing water absorption in the colon.¹¹ Glycerin has been well used and well studied in retrograde enemas and suppositories.^{14–16} Overall, glycerin has a rather safe side effect profile, especially relative to other commonly used enema solutions. One histological comparison of rectal mucosa in rats subjected to either glycerin or phosphate enema demonstrated less irritation with glycerin.¹⁶ Another study examined

differences in electrolyte and acid-base balance using 4 different irrigants in rabbits and revealed glycerin to have relatively minor effect compared to sodium phosphate or even isotonic saline solution.¹⁷

Experience with antegrade glycerin based enemas through MACE channels has been limited. Our results show that most patients (83%) who use glycerin do not need to irrigate the MACE daily and on average use only 30 ml glycerin. Based on our findings, fecal continence with glycerin use is high (95%). Interestingly fecal continence was achieved more often in patients requiring less tap water flush (less than 60 ml), suggesting that baseline colonic motility may potentially have a role in the attainment of fecal continence.

A previous study from Indiana University involving the largest cohort of patients with MACE to date outlined the institutional paradigm and trouble-shooting algorithm for MACE irrigation.⁶ The authors generally had patients start with tap water alone and found that with an average irrigation volume of 640 ml a fecal continence rate of 83% could be achieved. When patients began having trouble, the authors advocated MiraLAX®, GoLYTELY® or mineral oil. Glycerin was recommended for refractory cases only, although the authors did not specifically present results or outcomes using glycerin. With these additives, the authors increased the fecal continence rate to 94%, which is similar to the continence rate of 95% among glycerin users in the current study. Importantly the authors mentioned the possibility of cost serving as a potential barrier to glycerin use. While costs may not be covered by insurance, in our experience glycerin is commonly available at most drugstores for \$5 per 16 fluid oz.

At our institution in 2005 we began using glycerin based irrigation of MACE before discharge home. Our protocol is outlined in the figure. This regimen was based on our hypothesis that decreased volumes would be required for glycerin based irrigation, thus allowing patients greater independence since the irrigant is delivered using typically no more than 2, 60 ml catheter tipped syringes vs hanging an enema bag for higher volumes of tap water. As evidenced by our results, the average glycerin amount used was less than 30 ml, with a median total irrigant volume of 80 ml (average 160). Additionally with an average followup of 39 months from date of surgery our results appear durable.

Our study has several limitations. Our small sample size is a significant limiting factor for validating our results. However, having nearly 20 patients offers enough proof of concept power for demonstrating the efficacy of glycerin in this noncomparative study. Additionally we only analyzed patients with MACE using glycerin based irrigation and did not compare the outcomes against other irrigants or against patients using antegrade enemas through cecostomy tubes, because there were too few patients at our institution with cecostomy tubes or MACE using tap water alone to offer robust statistical comparisons. Finally, our study contains inherent biases due to its retrospective nature, and results require validation in a prospective study of fecal continence and quality of life for patients and caregivers.

CONCLUSIONS

Glycerin appears to be an effective MACE irrigant for improving fecal continence. The advantages of glycerin include low total volume of irrigation and less frequent irrigation, thus outweighing the cost. Glycerin should be considered in all patients with a MACE as a viable and effective first option for irrigation.

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Dr. Mark Barazza introduced the concept of glycerin based MACE irrigation to us.

Abbreviations and Acronyms

MACE Malone antegrade continence enema

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Figure.
Protocol for MACE irrigation

Table**Patient characteristics and outcomes**

Mean $\pm$ SD age at surgery (yrs)	8.8 $\pm$ 3.8	
No. gender (%):		
M	11	(58)
F	8	(42)
No. enema frequency (%):		
Daily	3	(17)
Every other day or less	16	(83)
No. stool continence (%):		
Yes	18	(95)
No	1	(5)
No. enema independence (%):		
Yes	6	(29)
No	15	(71)
No. occasional leakage from stoma (%):		
Yes	3	(16)
No	16	(84)
Evacuation time after enema (mins):		
Mean $\pm$ SD (range)	47 $\pm$ 16	(15–60)
Median (IQR)	60	(30–60)
Glycerin vol (ml):		
Mean $\pm$ SD (range)	29 $\pm$ 12	(10–60)
Median (IQR)	30	(20–30)
Tap water vol (ml):		
Mean $\pm$ SD (range)	131 $\pm$ 212	(15–775)
Median (IQR)	50	(30–80)
Glycerin + tap water vol (ml):		
Mean $\pm$ SD (range)	160 $\pm$ 214	(30–800)
Median (IQR)	80	(60–120)