# PEDIATRIC UROLOGY

# Bowel preparation prior to reconstructive urologic surgery in pediatric myelomeningocele patients

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**Introduction:** Mechanical bowel preparation (MBP) has historically been the standard of care for patients undergoing reconstructive urologic surgery, including urinary diversion. To date, several studies have examined the role of mechanical bowel preparation in postoperative outcomes in pediatric patients undergoing augmentation cystoplasty. However, these patient populations have been heterogeneous in nature, with no studies dedicated to examining the role of MBP prior to reconstructive urologic surgery in pediatric patients with myelomenginoceles. Thus, our objective was to retrospectively assess perioperative measures and postoperative complications after reconstructive urologic surgery with or without mechanical bowel preparation in pediatric myelomeningocele patients.

Materials and methods: From 2008 to 2013, 80 patients with myelomeningocele underwent reconstructive urologic surgery involving the use of bowel. Seventy

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Address correspondence to Dr. Nicholas J. Farber, Rutgers – Division of Urology, 1 RWJ Place, MEB Suite 584A, New Brunswick, NJ 08902 USA patients underwent a preoperative MBP while 10 did not. Perioperative measures and postoperative complications for these two cohorts were assessed.

**Results:** Eighty patients with myelomeningocele were identified; 70 patients underwent MBP while 10 patients did not. There were no statistically significant differences in demographics or operative time. There were no statistically significant differences in postoperative outcomes including time to first bowel movement and time to tolerating diet. There was also no significant difference in overall complication rate; patients with MBP had 31/70 (44%) complications while 2/10 (20%) of those without MBP had complications (p = 0.18).

**Conclusion:** There was no significant difference in perioperative measures and postoperative complications for patients who did not receive a mechanical bowel preparation. Our findings indicate that it is safe and warranted to perform a prospective, randomized study to better characterize the risks and benefits of preoperative bowel preparation for patients with myelomeningocele.

**Key Words:** bowel preparation, myelomeningocele, reconstructive urologic surgery, postoperative complications

#### Introduction

Historically, the practice of mechanical bowel preparation (MBP) was the standard of care in patients

undergoing elective colorectal surgeries. The intention of bowel preparation is to minimize the risk of infections and complications such as anastomotic leak.<sup>1</sup> In theory, the MBP accomplishes this goal by decreasing the bacterial load associated with fecal matter. Before long, preoperative MBP became the standard of care in urologic patients undergoing bowel procedures such as radical cystectomy with ileal diversion.<sup>2,3</sup> This practice became popular after reports that fecal contamination in radical cystectomy caused infectious complications in 18%-20% of patients.<sup>4</sup> The use of MBP soon became adopted throughout the field of urology, including within the pediatric urologic population.

Recently, the purported benefits of MBP in both colorectal and urologic surgery have been called into question. A meta-analysis for elective colorectal surgeries that included 13 randomized control trials with a total of 4,777 patients concluded that there was no significant difference in anastomotic leakage in patients with or without MBP and patients received no benefit from preoperative MBP.<sup>5</sup> In a retrospective study by Raynor et al, 70 adult patients underwent cystectomy and urinary diversion with 37 patients receiving MBP and preoperative enema and 33 patients receiving only an enema prior to surgery. There were no differences in perioperative outcomes, including gastrointestinal complications and infections, in these patients.<sup>6</sup> In a similar study by Large et al, 180 adult patients underwent cystectomy and urinary diversion with 105 patients receiving MBP and 75 without MBP. There were no differences in postoperative infectious, wound, or bowel complications between the two groups.7

Although there is an increasing body of evidence to demonstrate the lack of benefit of MBP in adults prior to urinary diversion, there is a relative paucity of information on the role of MBP in pediatric patients prior to urologic surgery. One retrospective study where Victor et al reviewed various series reported similar early postoperative infectious and anastomotic complication rates after augmentation cystoplasty with various types of gastrointestinal tissue in pediatric patients who did and did not undergo MBP.<sup>8-10</sup> A second study by Gundeti et al also found no differences in postoperative complications after pediatric augmentation ileocystoplasty when comparing these groups.<sup>11</sup>

While these studies both examine augmentation cystoplasty in pediatric urology patients, the study cohorts contain heterogeneous pediatric populations. The study by Victor et al includes 158 pediatric patients who underwent augmentation cystoplasty for neurogenic bladder, vesical exstrophy, cloacal exstrophy, posterior urethral valves, and anorectal malformation.<sup>8</sup> The study by Gundeti et al includes 46 pediatric patients with a variety of diagnoses including those with spina bifida, cloacal exstrophy, anorectal malformation and nonneurogenic neurogenic bladder.<sup>11</sup> Through our multi-institutional study, we sought to examine a specific group of pediatric patients – those with myelomeningoceles – to determine if bowel preparation prior to reconstructive pediatric urologic surgery impacted perioperative measures or surgical complications in this select population.

### Material and methods

We retrospectively reviewed the records of 80 children who underwent urologic surgery for management of neurogenic bladder at any one of three tertiary care institutions from 2008 through 2013. Manual chart review was performed by three individuals. Inclusion criteria included age 0 to 18 years, having a diagnosis of myelomeningocele (ICD-9 741.9), myelocystocele (741.9), or lipomeningocele (741.9), and having undergone urologic surgery for the management of neurogenic bladder, including creation of an appendicovesicostomy (CPT 50845), bladder neck reconstruction (53443, 51800), placement of a bladder neck sling (57288, 51845), creation of a Monti catheterizable channel (50825), and enterocystoplasty (51960). Patients who had undergone creation of Malone antegrade continence enema ostomy were also included (44320) and patients with sacral agenesis (ICD-9 756.13) were excluded.

The clinicodemographic information abstracted from the electronic medical records included the presence or absence of a ventriculoperitoneal shunt, history of spinal surgery, preoperative urodynamic parameters, home bowel regimen, the use and route of anticholinergic medications, and the presence or absence and type of preoperative bowel preparation.

All those who underwent bowel preparation were admitted to the hospital the day before surgery. Surgeons decided which patients would undergo bowel preparation and what type of bowel preparation to use. Bowel preparation included any combination of antibiotics (e.g. erythromycin, neomycin), bisacodyl (oral or per rectum), oral magnesium citrate, oral polyethylene glycol, sodium phosphate enema, or tap water enema.

Adverse preoperative events associated with the bowel preparation, intraoperative data, and postoperative outcomes were recorded. Primary outcomes were time until first bowel movement, time until tolerating home diet, length of hospital stay, presence of fever, and postoperative complications. Postoperative bowel function was assessed via careful examination of progress notes, evaluating for presence of flatus, abdominal distention, volume of bowel content, and presence/absence of bowel sounds. We included postoperative complications that had occurred at any point during the follow up period so as not to exclude severe, but remote complications such as bladder rupture. Data were evaluated with the Fisher's exact test and the t-test for independent means. A p value was considered significant if it was  $\leq 0.05$ .

#### Results

Overall, 80 myelomeningocele patients were identified. Of these, 70 children underwent bowel preparation prior

	Bowel preparation n = 70 (%)	No bowel preparation n = 10 (%)	p value
Mean age	12.1 years	11.2 years	0.78
Ventriculoperitoneal shunt	55 (79)	9 (90)	0.68

#### TABLE 2. Operative data

TABLE 1. Patient demographics

	Bowel preparation n = 70 (%)	No bowel preparation n = 10 (%)	p value
Robotic	30 (43)	4 (40)	1.00
Open	40 (57)	6 (60)	1.00
Bladder neck reconstruction/sling	50 (71)	8 (80)	0.72
Appendicovesicostomy	49 (70)	7 (70)	1.00
Enterocystoplasty	18 (26)	2 (20)	1.00
Monti catheterizable channel	16 (23)	1 (10)	0.68
Malone antegrade continence enema	10 (14)	1 (10)	1.00
Length of procedure	7.2 hours	8.5 hours	0.18

#### TABLE 3. Postoperative outcomes

	Bowel preparation n = 70 (%)	No bowel preparation n = 10 (%)	p value
Time until bowel-movement	3.6 days	3.1 days	0.63
Time until tolerating general diet	5.0 days	4.9 days	0.73
Temperature 38.0 or higher	26/67 (39)	4/10 (40)	1.00
Length of hospital stay	6.3 days	5.0 days	0.41
Mean follow up	2.61 years (median 1.76)	1.79 years (median 2.00)	0.88
Overall complication	31 (44)	2 (20)	0.18
Wound infection	9 (13)	0 (0)	0.59
Postoperative febrile urinary tract infection	7 (10)	1 (10)	1.00
Fistula formation	6 (9)	0 (0)	1.00
Bladder perforation	5 (7)	1 (10)	0.56
Bowel obstruction	4 (6)	0 (0)	1.00
Intraoperative bowel injury	0 (0)	0 (0)	1.00

to surgery (Group 1) while 10 did not undergo bowel preparation (Group 2). Clinicodemographic data is listed in Table 1. There was no statistically significant difference in the mean age or presence of ventriculoperitoneal shunt between groups with p = 0.78 and p = 0.68 respectively.

Operative data is listed in Table 2. Bladder neck reconstruction and appendicovesicostomy were the two most commonly performed procedures in both groups. Mean length of procedure was 7.2 hours in Group 1 and 8.5 hours in Group 2, with no significant difference in operative time, p = 0.18.

Postoperative outcomes are listed in Table 3. There was no significant difference between Group 1 and Group 2 with respect to bowel-related outcomes including time to first bowel movement (p = 0.63), and time until tolerating diet (p = 0.73). There were 31 (31/70; 44%) overall complications in Group 1 and two (2/10; 20%) overall complications in Group 2; there was no significant difference in overall complications between the two groups, p = 0.18. The most common complication in Group 1 was wound infection (9/70; 13%), compared to 0 patients in Group 2 (p = 0.59). There were no incidents of fistula formation or bowel obstruction in Group 2, though these were seen in 9% and 6% of Group 1, respectively. Postoperative febrile urinary tract infection was seen in 7/70 patients (10%) in Group 1 and 1/10 patient in Group 2 (10%). Similarly, 10% of those in Group 2 had a reported bladder perforation (1/10), compared to 7% in Group 1 (5/70).

#### Discussion

Recent data has called into question mechanical bowel preparation (MBP) as the standard of care for both elective colorectal surgery and urologic surgery. In the pediatric urology population there is also recent, albeit limited, evidence that questions the benefits of MPB prior to urinary diversion. Three previous studies have examined outcomes in pediatric urology patients foregoing MBP prior to reconstructive urologic procedures.

Victor et al retrospectively analyzed one institution's experience with augmentation cystoplasty in a case series of children without preoperative mechanical bowel preparation. In this review, 162 cystoplasties were performed from May 1987 to May 2006 in 158 children, none of whom underwent a preoperative mechanical bowel preparation. The study reports an early postoperative complication rate of 9.87%, which included 4 patients with urinary fistula and 3 patients with wound infection; no patients were found to have dehiscence at the intestinal anastomosis.<sup>8</sup> Their reported complication rate of 9.87% is similar to the

literature-reported 5% wound infection complication rates in patients receiving MBP prior to cystoplasty<sup>11</sup> and 3% overall complication rate in patients receiving MBP prior to elective intestinal operations.<sup>10</sup> While Victor et al importantly demonstrated the safety and feasibility of omitting MBP in augementation cystoplasty, two minor limitations of their study are the absence of a control group and the time span over which the study was conducted. Our study builds upon their case series by directly comparing a non-MBP group with a MBP group of patients who had undergone surgery by the same six surgeons in a more focused time frame, all of whom shared the diagnosis of neurogenic bladder owing to a spinal cord abnormality.

A more recent investigation by Gundeti et al studied 46 pediatric patients who underwent ileal cystoplasty; 24 patients underwent mechanical bowel preparation while 22 patients did not. In this study, postoperative complications included urinary tract infection, superficial wound infection and anastomotic leakage. They found no significant differences in hospital stay or postoperative complications in this pediatric population.<sup>11</sup> Both of these studies emphasize that there is no difference in postoperative complications, including anastomotic leakage, urinary fistulas and superficial wound infections, in patients who did not undergo a mechanical bowel preparation.

Finally, Casperson et al looked at a similar pediatric patient population and the effect of mechanical bowel preparation on ventriculoperitoneal shunt infection after reconstructive urologic surgery in patients with myelomeningocele. In this study, 31 pediatric patients were included who had a ventriculoperitoneal shunt and neurogenic bladder managed with urologic reconstructive surgery.<sup>12</sup> The rate of VP shunt infection was compared in 19 patients who underwent a preoperative MBP versus 12 patients who did not undergo a MBP. They found no difference in VP shunt infection rate; 10.5% of patients with MBP had a VP shunt infection compared to 8.3% VP shunt infection rate in those without MBP. While this study demonstrated the lack of effect of a MBP on VP shunt infection in the myelomeningocele population, it did not expand upon any other postoperative complications.

To our knowledge, our study is the first in the literature to examine the differences in postoperative outcomes with or without MBP in a dedicated cohort of patients with spina bifida. We aimed to compare the postoperative outcomes of a specific pediatric patient population, those with neurogenic bladders who underwent reconstructive urologic surgery with or without a mechanical bowel preparation. We found no difference in respect to bowel-related outcomes such as time to first bowel movement and time until tolerating home diet. There was also no difference in postoperative complications including anastomotic leak, dehiscence at the anastomotic site, fistula formation, or superficial wound infection. Our data corresponds to the recent data from both colorectal surgery and adult urologic surgery that calls into question the benefit of mechanical bowel preparation. This study further validates the need for a prospective randomized study to elucidate more clearly the risks and benefits of preoperative mechanical bowel preparation, suggesting that the risks in performing such a study should not be increased for the non-MBP arm.

This study was limited by its retrospective nature and subjected to flaws inherent in such a design. While we did not detect a statistically significant difference in postoperative complications in our patients, our sample size was relatively small. A larger cohort may be needed to detect any small differences in postoperative complications between patients who did or did not undergo a mechanical bowel preparation. Additionally, no standard bowel preparation protocol was used across the multiple institutions, though the majority of patients in the MBP cohort received both polyethylene glycol and oral antibiotics. Finally, adequate data could not be obtained from our records to determine whether MBP was associated with VP shunt complications. We have addressed these shortcomings by initiating a prospective randomized study to examine perioperative outcomes of patients with myelomeningocele undergoing urologic reconstructive surgery with or without mechanical bowel preparation.

## Conclusion

The clinical benefits of preoperative mechanical bowel preparation in reconstructive urologic surgery have recently been called into question. Furthermore, there is a relative lack of data on the benefits of MBP in the pediatric urologic populations. In our small review evaluating the role of MBP in pediatric patients with myelomeningocele who underwent reconstructive urologic surgery for management of neurogenic bladder we did not find any statistical difference in perioperative measures or postoperative complications. Further elucidation of the role of MBP in perioperative and postoperative complications in this specific population should be undertaken in a prospective, randomized study.

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