



Outcomes following Malone antegrade continence enema and their surgical revisions

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Abstract

Background/Purpose: The Malone antegrade continence enema (MACE) channel is an effective means to manage patients with neurogenic bowel; however, complications may occur that may require surgical revision. Specific reports of the outcomes of these interventions are limited. We describe our clinical results following revision of MACE.

Methods: We retrospectively identified patients undergoing MACE revision for at our institution between 1997 and 2009. Type of MACE (in situ appendicocecostomy (AC = 247), ileocecostomy (IC = 25), cecal flap (CF = 10)) performed was recorded, time from creation to revision, site of revision, and need for repeat surgical revision were recorded.

Results: Of a total of 282 patients that underwent creation of MACE during the study period, 49 patients (17%) required surgical revision. Of these 49 patients, 42 had undergone AC, four had IC and three had CF. Mean time from MACE creation to revision was 19 months. Sixty-eight revision procedures were performed in the 49 patients. Skin level or endoscopic procedures accounted for 52/67 (78%) procedures. Sixteen patients (33%) required more than one revision and three patients (6%) required more than two procedures.

Conclusions: Skin level revisions accounted for over three-fourths of MACE revisions. In our series, two thirds of patients requiring revision required only a single procedure, but one third required more than one revision.

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The antegrade continence enema originally described by Malone et al has proven to be an extremely successful procedure to achieve fecal continence in the medically refractory child suffering from fecal incontinence secondary to neurogenic bowel [1]. As with any surgical procedure postoperative complications may occur. Difficulty catheter-

izing the Malone antegrade continence enema (MACE) channel is the most frequently reported complication with reports ranging from 5% to 36% [2–5]. It can occur either at the skin level from stomal stenosis or intraabdominal obstruction due to obliteration, angulation, and/or false passage of the channel, with the latter more commonly encountered. Stomal incontinence is a highly distressing complication to the patient with published reports of stomal incontinence rates range from 3% to 6% [2–5]. Persistent stomal incontinence usually leads to another surgical procedure to correct the problem.

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Surgical revision is reported to be needed in a minority of patients that undergo a MACE procedure [1–12]. However specific reports of the outcome following MACE surgical revision are limited in the literature. The purpose of this study was to report our clinical outcomes following surgical revision of MACE.

1. Materials and methods

Institutional review board approval was obtained for the retrospective review of patients that had undergone MACE revision at our institution between 1997 and 2009. Indications for revision were recorded. Operative reports at the time of creation of MACE as well as at the time of revision were reviewed. Outpatient clinic notes were also reviewed to assess functional outcomes with respect to occurrence of stomal stenosis, ease of catheterizability, stomal continence and fecal continence. Our indication for recommending surgical intervention for stomal stenosis was either an inability to, pain with or bleeding upon passing an 8F catheter through the stoma following a course of a topical steroid to the stoma. The indications for surgical revision for stomal incontinence were stomal leakage that did not resolve after a period of observation in case such stomal leakage was due to colonic hyperactivity for acute colitis or diet. We also reinforced proper technique of enema administration to make sure the stomal incontinence was not result of leakage of instilled enema within the appendiceal lumen rather than retrograde leakage of stool.

The type of MACE was divided into one of three groups based upon original surgical technique utilized for their creation; in situ appendicocostomy (AC) with or without splitting of the appendix for concomitant appendicovesicostomy creation [6,7], ileocostomy: a transverse retubularized segment of ileum (Monti) implanted into the tenia of the cecum (IC) [4,8], or cecal flap: a lateral flap of cecum is raised on the right colic artery, tubularized and buried into a seromuscular tunnel (CF) [9,10]. A uniform method for stomal creation was employed in our series. In brief creation of skin flap for stoma was a broad based U shaped flap brought to the apex of a spatulated MACE channel. We deliberately did not attempt to conceal the mucocutaneous border of the catheterizable stoma as some techniques, such as VQZ, strive to do.

The time from creation of the MACE to time of revision was recorded as well as mean follow-up after revision. The type of revision was divided into three groups: skin level, endoscopic or subfascial. Any need for additional repeat surgical revision was noted. The presence of a catheterizable MACE, whether utilized or not, at last follow-up was noted to assess technical outcome of surgical revision. Functional outcome of fecal continence was defined as no leakage of stool per rectum for greater than 1 year.

All values are reported as mean \pm standard deviation. Comparisons between groups for continuous variables

utilized Student t test. To assess association between type of channel and revision rate, stomal location and revision rate a Fishers exact test was performed. A *P* value $< .05$ was considered statistically significant.

2. Results

A total of 308 patients underwent creation of MACE during the study period. Follow-up of at least 6 months was available in 282 patients of these patients (92%). Two hundred thirty-six of the patients in this series have been previously reported [2]. Over ninety percent of the cohort had myelomeningocele as the etiology for their neurogenic bowel while anorectal malformations comprised only 5%. The median age of MACE creation was 9 years old with a range of 2 to 36 years old. Forty-nine (17%) of the 282 patients required surgical revision and are the emphasis of this manuscript. The mean and median age at creation of MACE in these 49 patients was 10 and 8 years old, respectively (range 2–26 years old). The mean and median age at first revision was 12 and 9 years old, respectively (range 3–30 years old).

Sixty-eight procedures were performed in the 49 patients. Indications for revision included stomal stenosis ($n = 46$, 68%), difficulty catheterizing the channel deep to the skin level ($n = 12$, 18%), stomal incontinence ($n = 7$, 10%), stomal prolapse ($n = 2$, 3%) and cecal volvulus ($n = 1$, 1%) (Table 1). Utilizing the recently described stomal incontinence grading scale of Henrichon et al all patients in our series who underwent revision had stomal leakage more than 4 times per month defined as grade 3 according to the aforementioned grading criteria [13]. Mean and median time from MACE creation to revision was 19 and 11 months, respectively (range 6 to 105 months). Mean follow-up after revision was 44 ± 34 months (range 6–121 months). The mean and median time to revision for in situ appendicocostomy was 20 and 11 months, respectively. The mean and median time to revision for split appendix appendicocostomy was 13 and 8 months, respectively. The mean and median time to revision for ileocostomy was 12 and 9 months, respectively. The mean and median time to revision for cecal flap was 12 and 11 months, respectively. Statistical comparison between all groups failed to reveal that

Table 1 Indications for MACE revision.

Indication	Number of procedures
Stomal stenosis	46
Difficulty catheterizing	12
Stomal incontinence	7
Stomal prolapse	2
Cecal volvulus	1
Total number procedures	68

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