A Comparison of the Monti and Casale (Spiral Monti) Procedures

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Purpose: We present our long-term followup and comparison of outcomes between the Monti and Casale (spiral Monti) procedures in a large group of children and young adults.

Materials and Methods: A retrospective chart review was done, including all patients undergoing the Monti or Casale procedure at our institution with a minimum followup of 6 months. Age at surgery, the bowel segment used, stomal location, the number and type of revisions or endoscopic procedures required after channel creation, problems catheterizing and channel continence were documented, and a database was created.

Results: Of 188 patients identified with at least 6 months of followup 109 underwent a Monti procedure, while 79 underwent a Casale procedure. Patient age at surgery was 10 months to 31 years (mean 10.2 years). Mean followup was 43 months for the entire cohort, and 47.2 and 37.2 months for the Monti and Casale groups, respectively. A total of 43 open revisions were required in 36 patients (19.1%). Stomal revisions accounted for 18 procedures, while subfascial revisions accounted for 25 in 17 (9.0%) and 21 (11.2%) patients, respectively. A total of 21 endoscopic procedures requiring anesthesia were performed in 17 patients (9.0%). In the Monti group stomal revision was required in 11 patients (10.1%), while subfascial revisions were required in 9 (8.3%). In the Casale group stomal revision was required in 6 patients (7.6%), while subfascial revisions were required in 12 (15.2%). Of the channels 98% were completely continent at the stoma.

Conclusions: In a large population of children and young adults we report durable and reliable long-term results with the Monti and Casale procedures, including continence at the stoma. The only significant difference noted between the 2 procedures was a higher incidence of subfascial revisions for umbilical stomas in each group. The need for subfascial revision is highest in spiral Monti channels placed in the umbilicus.

Key Words: urinary bladder, neurogenic; stomas; urinary catheterization; appendix; urinary diversion

The Mitrofanoff principle for creating a continent catheterizable stoma using appendix has been a mainstay in the armamentarium of pediatric urologists and reconstructive surgeons since it was originally described in 1980.[1] Applications of this technique have expanded to include the use of ureter, tapered ileum, stomach, tubularized bladder flaps and transverse tubularized bowel, as originally described by Yang[2] and Monti et al,[3] and later modified by Casale.[4] Interest in these other tissues stems from the occasional lack of a suitable appendix or more commonly the desire to use the appendix for the MACE procedure.[5] The Yang-Monti and Casale (spiral Monti) techniques for creating a continent catheterizable channel using a transversely tubularized bowel segment have been used extensively in pediatric reconstruction for several years, especially when the appendix is not available or usable. Although it is generally accepted among pediatric urologists that the appendix is the ideal channel for Mitrofanoff creation, increasing use of the MACE procedure has expanded the need for alternative tissues for the Mitrofanoff channel.

When the Monti channel does not provide adequate channel length to traverse the abdominal wall without tension, the Casale procedure has become the best alternative. To our knowledge there are no published comparisons to date of the classic Monti tube to the Casale method with respect to long-term outcomes. We have routinely performed the Yang-Monti or Casale procedure as an isolated procedure in select cases but more commonly in conjunction with the MACE procedure and/or bladder augmentation. We report long-term followup and a comparison of outcomes between the Monti and Casale procedures in a large cohort of young patients.

MATERIALS AND METHODS

A retrospective chart review was done, including all patients undergoing the Monti or Casale procedures at our institution with a minimum followup of 6 months. Age at surgery, the bowel segment used, stomal location, the number and type of revisions or endoscopic procedures required after channel creation, problems catheterizing and continence of the channel were documented and a database was created. All postoperative procedures related to the channel that required anesthesia were included in the analysis.

Open revision procedures were classified as stomal or subfascial, of which the latter included revisions for angulation leading to catheterization problems or false passage as well as bladder level problems such as inadequate tunnel

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length. Open revisions for stomal stenosis or granulation tissue that remained extraperitoneal were classified as stomal. Endoscopic procedures were classified as diagnostic if the channel was easily catheterizable intraoperatively and cystoscopically appeared normal. Endoscopy was classified as therapeutic if it required dilation, endoscopic incision of a stricture or tissue web, catheter placement over a wire or difficult catheterization with an indwelling catheter secured for several days postoperatively to achieve passive dilation.

Statistical analysis was performed using SAS®. Chi-square analysis was used for comparisons of complications between Monti and Casale groups, and between umbilical and RLQ stomal sites. Fisher's exact test was used for subgroup comparisons.

RESULTS

Between 1997 and 2004, 201 patients underwent a Monti or Casale procedure for creation of a catheterizable urinary channel. Of the 188 patients identified with at least 6 months of followup postoperatively 109 (58%) underwent a single Monti procedure, while 79 (42%) underwent a Casale procedure. No double Monti channels were created and when possible the channel was implanted into the bladder rather than into an intestinal segment. The channel was constructed from ileum in all except 3 patients, in whom sigmoid colon was used. Patient age at surgery was 10 months to 31 years (mean 10.2 years). Mean followup was 43 months (range 6.5 to 97) for the entire group, and 47.2 (range 6.7 to 97) and 37.2 months (range 6.5 to 86.3) for the Monti and Casale subgroups, respectively.

In the entire group a total of 43 open revisions were required in 36 patients, yielding an open revision rate of 19.1%. There were a total of 18 stomal revisions in 17 patients (9.0%) and 25 subfascial revisions in 21 (11.2%). One of these patients required subfascial revision and 2 stomal revisions but is now completely continent at the stoma and catheterizes without difficulty. One patient required stomal revision and subsequent subfascial revision. A total of 21 endoscopic procedures requiring anesthesia were performed in 17 patients (9.0%). Six of these procedures were purely diagnostic for reported catheterization difficulties, while 15 were therapeutic. One of these patients required a diagnostic and therapeutic endoscopic procedure, while 1 required 1 diagnostic and 3 therapeutic procedures. These 2 patients are now completely continent at the stoma and have no difficulty catheterizing. A total of 143 (76.1%) patients required no channel related surgery during followup and 152 (80.9%) required no open revisions.

A total of 22 open revisions in 20 patients (18.3%) were required in the 109 undergoing the Monti procedure compared to 21 revisions in 16 (20.3%) of the 79 who underwent creation of a spiral Monti. In the Monti group 11 patients (10.1%) required stomal revision and 9 (8.3%) required subfascial revisions with 2 of the latter requiring a second revision. Nine Monti cases (8.3%) required endoscopy postoperatively. One of these patients required a therapeutic and a diagnostic endoscopic procedure, while 5 others required a single therapeutic endoscopy and 3 underwent purely diagnostic cystoscopy via the channel. Of all 109 patients with a Monti channel 83 (76.1%) required no postoperative procedures related to the channel and 89 (81.7%) required no open revisions.

In the Casale group stomal revision was required in 6 patients (7.6%), of whom 1 required 2 revisions. Subfascial revisions were required in 12 patients (15.2%), of whom 2 required a second revision. Endoscopy was performed in 8 patients (10.1%), of which 1 was purely diagnostic. Six patients underwent a single therapeutic endoscopy, of whom all currently catheterize successfully. One patient required 1 diagnostic and 3 therapeutic endoscopies, and is now catheterizing successfully. Of the 79 patients with a Casale channel 60 (75.9%) required no postoperative procedures related to the channel and 63 (79.7%) required no open revisions.

Stomas were placed at the umbilicus in 95 patients (50.5%) and in the RLQ in 80 (42.6%). Stomal location could not be determined from the operative report in 9 patients and it was the left lower quadrant in 4. Of the 95 umbilical channels a total of 27 open revisions were required in 21 (22.1%) patients, including only 8 at the stomal level in 7 (7.4%) patients and the other 19 in 16 patients (16.8%) at the subfascial level. Three of these 16 patients required 2 subfascial revisions, while the other 12 required 1 revision each. One of the 7 patients requiring stomal revision required a second revision. A total of 13 endoscopic procedures were required in this group of patients, of which 10 were therapeutic and 3 were diagnostic.

Of the 80 RLQ stomas a total of 14 open revisions were required in 13 patients (16.3%). Eight patients (10.0%) required a single stomal revision, while 6 subfascial revisions were required in 5 (6.3%). Seven endoscopic procedures were required in this group, of which 4 were therapeutic and 3 were diagnostic.

At last followup 169 of the 188 patients (89.9%) reported no significant difficulty catheterizing the urinary channel, while 14 continued to report some difficulty but were able to successfully catheterize as directed. Seven of these patients required no surgical intervention postoperatively and all were continent at the stoma. The other 7 patients each required 1 postoperative intervention, including subfascial revision in 1, and stomal revision, diagnostic cystoscopy and therapeutic cystoscopy in 2 each. One of these patients had occasional leakage at the stoma, while the remaining 6 were completely continent. Four channels became obliterated or could not be catheterized, of which 1 was recently revised. An additional channel was abandoned due to poor patient compliance, obesity and subsequent lack of use. Therefore, at last followup 183 patients (97.3%) were able to catheterize successfully.

Continence via the channel could be assessed from records in all except 2 patients. Four patients (3.2%) reported rare or occasional leakage at the stoma but none had frank leakage. Two of these patients have a Casale channel to the umbilicus, while the other 2 have a Casale channel to the left lower quadrant and a Monti channel to the umbili-

TABLE 1. *Complications of Monti vs Casale procedures*

	No. Monti (%)	No. Casale (%)	p Value (chi-square test)
Overall	109	79	
Difficult or unable to catheterize	10 (9.2)	9 (11.4)	0.62
Endoscopy with anesthesia	9 (8.3)	8 (10.1)	0.66
Stomal revision	11 (10.1)	6 (7.6)	0.56
Subfascial revision	9 (8.3)	12 (15.2)	0.14
Open revision	20 (18.3)	16 (20.3)	0.74
Any surgery	26 (23.9)	19 (24.1)	0.98