CONTINENT ILEOCECAL DIVERSION WITH AN UNALTERED IN SITU APPENDIX CONDUIT


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ABSTRACT

Purpose: We performed continent urinary diversion using an unaltered, in situ appendix to decrease the risk of appendicoicolic manipulation.

Materials and Methods: Since September 1994, 19 patients a mean of 46.5 years old underwent continent urinary diversion with an ileocecal segment and an unaltered, in situ appendiceal conduit. In 1 case of a permanent colostomy we performed simple transposition of the appendix on the ileal pouch as a conduit, which to our knowledge is the first reported case.

Results: During the 4 to 24-month followup (mean 12) 17 patients were continent day and night, defined as being completely dry for 3 to 5 hours. Two patients were occasionally incontinent at night. One patient with a history of multiple operations who was completely incontinent achieved complete continence with endoscopic polytetrafluoroethylene (Teflon) injection at the appendicoicolic junction.

Conclusions: This unaltered in situ appendix technique is timesaving, safe, effective and comparable with other methods that provide urinary continence.

KEY WORDS: urinary diversion; appendix; urinary reservoirs, continent

In the past continent reconstruction of the lower urinary tract, usually after cystectomy, had not been widely performed for many reasons. A lengthy surgical procedure added to the original operation and poor continence rates prevented it from becoming routine rather than exceptional, while a long learning curve discouraged many surgeons. Today the introduction of rapidly constructed, low pressure reservoirs and the advent of successful small lumen conduits have combined to offer a continence mechanism when diversion is necessary. The fashioning of continent cutaneous stomas remains the most challenging aspect of continent urinary reservoirs. The stoma must provide continence and allow easy catheterization by the patient. Currently the most popular methods of continent urinary diversion include the Kock, Indiana pouches, and the Mitrofanoff procedure. We report our experience with the unaltered, in situ appendix only as a conduit in 20 patients.

PATIENTS AND METHODS

From September 1994 through September 1996, 11 men and 8 women 8 to 75 years old (mean age 46.5) underwent continent urinary diversion with an ileocecal segment and an in situ, unaltered appendiceal conduit. In 1 woman with paraplegia, a severe pelvic deformity and a permanent colostomy an ileocoeal pouch would have caused a risk of diarrhea due to ileocoeal valve removal and ileocolonic anastomosis in proximity to the colostomy. Therefore, we reconstructed an ileal pouch and performed simple transposition of the appendix without submucosal tunneling. To our knowledge this is the first report of simple transposition of the appendix on an ileal pouch to date.

Indications for urinary diversion included bladder cancer in 12 patients, bladder extrophy in 1 who underwent ureterosigmoidostomy in infancy, bladder extrophy in 1 with a low capacity bladder and incontinence, neurogenic bladder dysfunction in 2, severe bladder rupture due to trauma in 2, a contracted bladder due to tuberculosis in 1 and a large vesicovaginal fistula in 1. In all patients the appendix was available and suitable for construction of the continence mechanism with suitable defined as at least 5 cm. long with a patent lumen that accommodates a 10 to 12F catheter.

The ileocecal segment of bowel, comprising approximately 20 cm. of terminal ileum, appendix and 20 cm. of cecum ascending colon, was isolated and bowel continuity was restored (see figure). The appendix was catheterized with a 10 to 12F feeding tube after excision of the tip. The chosen segment was opened along the antimesenteric border and the reservoir was constructed. The ureters were reimplanted into the posterior wall of the reservoir (ascending colon) by placing 3 to 4 cm. of each ureter within a mucosal gutter without

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attempts at tunneling. The ureters were then catheterized. The reservoir was closed over a 30F Malecot catheter.

The pouch was rotated 90 degrees, so that it would lie in the pelvis without tension on the vascular pedicle or ureterocoeal anastomosis. In this manner the appendix was directed toward the umbilicus. The reservoir was filled with 300 to 400 ml. normal saline and, if there were no leaks from the appendix, a cutaneous stoma was created. In 2 patients we placed the stoma in the lower right abdominal quadrant but in 18 the stoma was located in the umbilical funnel. Before the abdominal wall was reconstructed the pouch was fixed to the inner abdominal wall fascia by 4 interrupted 3-zero polypropylene sutures.

RESULTS

There were no operative mortalities or major perioperative complications. In 1 patient we dilated the 8F appendiceal lumen to 12F. None of these 20 patients underwent appendiceal reinforcement. Followup ranged from 4 to 24 months (mean 12). Reservoir capacity was 500 to 1,000 ml. 3 to 6 months postoperatively. A total of 17 continent patients, who were completely dry for 3 to 5 hours day and night, easily emptied the reservoir within this period, that is every 3 hours, with a 12 to 14F catheter. No difficulty was observed regarding mucous clearance from the reservoir with this size catheter.

Two patients were occasionally incontinent at night. In 1 patient who was completely incontinent we injected 0.5 ml. polytetrafluoroethylene (Teflon) paste submucosally in the appendiceococcal junction with an 11F pediatric cystoscope, and the patient became dry for 4 to 5 hours. A patient in whom malignancy recurred died 6 months postoperatively. During followup we noted no complications, such as stomal stenosis, difficult catheter insertion, stomal prolapse or stone formation.

DISCUSSION

When appendix is selected as a continent cutaneous stoma, using it as an intact conduit avoids unnecessary and time-consuming manipulations, such as those necessary in the original Mitrofanoff procedure,4 invaginated appendix5 and so forth, resulting in a shorter operative time, a technically easier operation and fewer complications of the appendiceococcal junction. In addition, the resulting continence rate of 17 of 20 patients appears to be acceptable.

According to Issa et al, using the in situ, intact appendix has many advantages.5 For example, a considerable length of ileum is spared from being used to construct the stoma. The narrow lumen of the appendix has an added advantage in facilitating catheterization by preventing inadvertent looping of the catheter, which can result from catheterization of the wider lumen of the ileal stoma. There is no cecal defect resulting from an isolated appendix, as in the original Mitrofanoff technique, which eliminates the potential risk of leakage from this site. Since there is no manipulation of the appendicocolic junction, relatively longer segments of appendix are available to traverse the abdominal wall in obese patients. Avoiding excessive use of sutures and minimizing appendiceal mobilization eliminate or decrease the risks of tissue devitalization, necrosis, erosion and a nidus for stone formation.10 Moreover, the technique of creating an ileal nipple by invagination and intussusception is much more complicated and time-consuming.11 Therefore, when the appendix is available and suitable, we prefer to use it as a continent mechanism.

Stone formation was not noted in any of our patients during the followup of 4 to 24 months. Simple endoscopic management may be restricted by conduit diameter. Nevertheless, should such a complication occur percutaneous access by endoscopic means, as proposed by Barker,12 should be easy because the reservoir is adjacent to the anterior abdominal wall and adherent to it at the site of the scar left by the postoperative Malecot drainage catheter. We believe that the continence mechanism in our patients probably depends on several factors, including the continence properties of the appendicocolic junction, the narrow appendiceal lumen, a high capacity, low pressure dependent reservoir and the peri-staltic activity of the appendix toward the reservoir. In conclusion, our preliminary study indicates that a narrow appendix is a safe, effective and useful organ for providing urinary continence.

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REFERENCES


EDITORIAL COMMENT

The authors are to be congratulated on their attempt to simplify the creation of the continent outlet in continent cutaneous urinary diversion. With this technique risks of dissecting the appendix from the cecum and reanastomosis, such as ischemia, leakage and stenosis, are obviously minimized compared to the original Mitrofanoff technique (reference 4 in article), when applied to an ileocecal reservoir as in the Penn pouch technique.1 However, the degree of continence achieved with this technique is obviously limited by the presence of a leak point ("completely dry for 3 to 4 hours"), which is characterized by a specific reservoir volume or pressure at which overflow incontinence results. This leak point is expected based on the morphological and functional studies of the closure characteristics of the cecoappendiceal junction of Hübner et al.2 A leak point and overflow incontinence can be avoided by in situ submucosal embedding of an otherwise unaltered appendix.3 This technique does not increase the complexity of surgery to any substantial degree or have any of the risks of transecting the appendix from the cecum. The flap valve principle of using a small caliber tube, which is submucosally embedded, provides complete continence and applies not only to the appendix, but also to tubes created from large5 or small bowel.6
the diameter may be adapted to accommodate larger bore catheters for the ease of evacuating urine and mucus.

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The only obstacle to the recommendation of Thuroff is the occasional short length of appendix, especially in obese patients when it will be difficult or impossible to bring the appendix to the skin. We also wish to indicate that in 2 of our patients the continence interval increased to 8 hours within 6 months postoperatively.