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Short-term outcomes after incontinent conduit for gynecologic cancer: Comparison of ileal, sigmoid, and transverse colon

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HIGHLIGHTS

- The 30-day rate of significant conduit-related complications after incontinent conduit formation was 15.1%.
- By 90 days, the Kaplan–Meier estimated rate of significant conduit-related complication was 21.8%.
- There were lower rates of significant conduit-related complications in the transverse colon conduit group.

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ABSTRACT

Objective. The aim of this study is to estimate the overall rates of significant incontinent conduit-related complications and compare rates between conduit types.

Methods. This was a retrospective review of 166 patients who underwent incontinent urinary diversion from April 1993 through April 2013.
Patients were categorized by conduit type—ileal, sigmoid colon, and transverse colon. Significant conduit-related complications were assessed at 30 and 90 days after surgery. Significant conduit-related complication was defined as any of the following: ureteral stricture, conduit leak, conduit obstruction, conduit ischemia, ureteral anastomotic leak, stent obstruction requiring intervention via interventional radiology procedure or reoperation, and renal failure.

Results. A total of 166 patients underwent formation of an incontinent urinary conduit, most commonly during exenteration for gynecologic malignancy. There were 129 ileal, 11 transverse colon, and 26 sigmoid conduits. The overall significant conduit-related complication rate within 30 days was 15.1%. Complication rates for ileal, transverse and sigmoid conduits were 14.7%, 0%, and 23.1%, respectively (Fisher's exact test, $p = 0.24$). By 90 days, the Kaplan–Meier estimated rates of significant complications were 21.8% overall, and 22.3%, 0%, and 28.9%, respectively, by conduit type (log-rank test, $p = 0.19$). The most common significant conduit-related complications were conduit or ureteral anastomotic leaks and conduit obstructions. By 1 and 2 years following surgery, the Kaplan–Meier estimated overall rate of significant conduit-related complication increased to 26.5% and 30.1%, respectively.

Conclusions. Our study suggests that there are multiple appropriate tissue sites for use in incontinent conduit formation, and surgical approach should be individualized. Most significant conduit-related complications occur within 90 days after surgery.

Introduction

Formation of a urinary conduit is a critical aspect of reconstruction after pelvic exenteration for gynecologic malignancy. While there are several options, incontinent conduits continue to be a good choice for simple diversion and preferable for many patients. These may be formed using any portion of the intestine, most commonly the distal ileum or sigmoid or transverse colon. There has been debate in the surgical literature regarding the optimal tissue and type of urinary conduit; while a comparison of colonic versus ileal conduits was published in 2012 [1] the largest recent series was published in 1996 [2] and was limited to outcomes for transverse colonic conduits. The last direct comparison of all conduit types appeared in 1986 [3]. In several studies examining outcomes for patients undergoing pelvic exenteration, use

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of transverse colon conduits was associated with fewer serious surgical complications [4,5], with a possible advantage due to use of non-radiated bowel. However, other series have found no significant advantages to the use of one location of bowel harvest for the conduit versus another [1,2].

Recent studies have focused on continent versus incontinent urinary conduits, with similar complication rates reported aside from an increased risk of stone formation in continent conduits [6–9]. However, most studies lack long-term follow-up or patient satisfaction data, which are important in evaluating continent conduit outcomes. In one study 54% of patients who had a continent conduit reported that they would have chosen an incontinent conduit if given the option again, due to issues with self-catheterization [1]. In a German study comparing incontinent ileal conduit at the time of pelvic exenteration to formation of a continent ileal pouch, the mode of urinary diversion did not significantly impact survivor quality of life, but surgeries for stomal complications and treatment of stones were more common in continent diversions [10]. For many patients an incontinent conduit will remain a preferred option. As there is little recent literature comparing outcomes with use of various types of incontinent conduits, we analyzed our institutional experience using three types of conduits, with detailed analysis of type and timing of significant conduit-related complications and focused review of the precedent literature. These findings should be of value in counseling patients and making a reasoned surgical choice.

Methods

This was a retrospective review of patients undergoing incontinent urinary diversion by a gynecologic oncologist at Mayo Clinic from April 1993 through April 2013, either alone or at the time of total or anterior pelvic exenteration. Institutional Review Board approval was obtained for this study. Patients were excluded if a gynecologic oncologist did not perform surgery or if the patient did not consent to the use of their medical records for research purposes.

The method of ileal conduit formation used was that described by Bricker [11]. Sigmoid conduits were created in the setting of end colostomies with no distal anastomosis. Urinary diversion using a transverse colon conduit was performed as described by Schmidt [12], with modification for use of modern gastrointestinal staplers, and is described briefly. Sufficient conduit length is obtained to allow formation of an everting stoma, and is usually based upon adequate blood supply from the middle colic artery. The greater omentum is dissected off the surface of the transverse colon, which is then divided, with bowel continuity reestablished by end-to-end anastomosis. The mesocolic defect is loosely closed. The end of the conduit chosen to be proximal is closed in two layers and is fixed to the posterior parietal peritoneum at or near the midline. The ureters are then dissected proximally, spatulated, and sutured into the conduit, with deployment of ureteric stents. The distal end of the conduit is then brought to the stoma site and matured.

Medical records were reviewed and the following information was abstracted: age, body mass index (BMI), smoking status, presence of comorbidities (e.g. diabetes, hypertension), prior urinary tract issue, prior abdominal surgery, prior radiation exposure, preoperative creatinine, surgical indication, type of conduit, type of procedure, and concomitant pelvic floor or vaginal reconstruction. Follow-up was limited to clinical notes and correspondence contained in the medical record. All complications were recorded along with the date noted, as well as necessary interventions. We defined significant conduit-related complications as the following: ureteral stricture, conduit leak, conduit obstruction, conduit ischemia, ureteral anastomosis leak, stent obstruction requiring intervention via interventional radiology procedure or reoperation, and renal failure. All of the mentioned complications were recorded if noted in the chart, whether found on routine imaging or by symptomatology. The percentage of significant conduit-related complications requiring intervention was also recorded. Renal failure was defined as renal dysfunction requiring dialysis or noted as a prolonged clinical problem in the chart. The date of the last relevant clinical follow-up, vital status and date of last follow-up or death were recorded.

Results were summarized using standard descriptive statistics. Baseline patient characteristics were compared between the three conduit groups using the Wilcoxon rank-sum test for continuous variables and the Fisher's exact test for categorical variables. The complication rates within the first 30 days were compared between the three conduit groups using Fisher's exact test. The complication rates by 90 days, 1 year and 2 years, respectively, were estimated using the Kaplan–Meier method to take into account the varying duration of follow-up. The Kaplan–Meier methodology was chosen to estimate the 90-day complication rates due to censorship of patient deaths within the first 90 days and those who did not have 90 days of relevant clinical follow-up. All calculated p-values were two-sided and p-values less than 0.05 were considered statistically significant. Analyses were performed using the SAS version 9.2 software package (SAS Institute, Inc.; Cary, NC).

Results

During the 20-year period, a total of 166 patients underwent formation of an incontinent urinary conduit. The ileum was used for 129 conduits, the transverse colon for 11 and the sigmoid colon for 26. Patient characteristics were similar across conduit type, with a mean age of 60.2 years for the cohort as a whole. Body mass index was also similar across the groups with a mean of 28.0 kg/m^2. The majority of patients were not current smokers, had a normal preoperative creatinine, a history of prior abdominal surgery, and had received prior radiation, with pelvic external beam therapy being the most common modality of treatment (Table 1). The indication for surgery is listed in Table 2; most were done as part of exenterative surgery though nearly 10% were due to fistula related to prior/current malignancy. In this cohort, only 7.2% ($N = 12$) underwent formation of a conduit only; the remainder underwent conduit formation with either total (44.0%, $N = 73$) or anterior (48.8%, $N = 81$) pelvic exenteration. Nearly three-fourths (70.5%, $N = 117$) had pelvic floor reconstruction with an omental flap, muscular flap, or combination.

The primary outcome for this study was the rate of significant conduit-related complications, as defined in the methods, within 30 days and 90 days of surgery (Table 3). Of the 166 patients, 25 experienced a significant conduit-related complication within 30 days postoperatively, for an overall rate of 15.1%. Of the 141 patients without conduit-related complications, all but 10 had at least 30 days of relevant clinical follow-up (1 died post-operatively from a pulmonary embolism and 9 cases had between 6 and 24 days of follow-up). The 30-day conduit-related complication rate was 14.7% (19/129) for the ileal conduit group, 0.0% (0/11) for transverse colon, and 23.1% (6/26) for sigmoid colon. There was no statistically significant difference between the groups for 30-day significant conduit-related complications ($p = 0.24$, Fisher's exact test) though power was limited due to low numbers and lack of complications in the transverse colon group. There were 3 non-conduit anastomotic leaks diagnosed within the first 30 days after surgery, all in the ileal conduit group, for an ileal conduit rate of 2.3% and an overall rate of 1.8%. Radiation was not associated with complication rates when examining separate conduit groups. Within the first 90 days postoperatively, 34 patients (crude rate = 20.5%, Kaplan–Meier rate by 90 days = 21.8%) developed a significant conduit-related complication. Specifically for the ileal, transverse, and sigmoid conduit groups, Kaplan–Meier rates for significant 90-day conduit-related complication rates were 22.3% ($N = 27$), 0.0% ($N = 0$), and 28.9% ($N = 7$), respectively (log-rank $p = 0.19$). Smoking status, diabetes, prior urinary tract issue, and prior radiation were not associated with either of the two outcome measures (Table 4).

We evaluated the management of significant conduit-related complications. Twenty-five patients had a 30-day conduit-related complication, of which 14 required an interventional radiology (IR) procedure