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Secondary malignancy after urologic reconstruction procedures: 
a multi-institutional case series☆,☆☆,☆☆☆

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Summary

Urinary diversion and reconstructive urologic procedures are most often performed by 
incorporating various intestinal segments into the urinary tract. Although the risk of 
malignancy, among other complications, is well recognized and occurs most frequently after 
ureterosigmoidostomies and cystoplasties, data on the histopathologic and immunohistochemical 
characteristics of these tumors are scant. This study aims to evaluate the clinicopathological 
features of secondary tumors arising after urologic reconstruction procedures.

Eleven cases were identified among five collaborating academic institutions. The average age 
was 51.7 years, and the M:F ratio was 8:3. Surgical procedures included 7 ileal conduits, 2 
gastrocystoplasties, 1 augmentation cystoplasty not otherwise specified (NOS), and 1 Indiana 
pouch. Median time from reconstruction to malignancy was 36 years. Malignancy included 
adenoacarcinoma in 10 patients (intestinal type in 6, gastric in 2, signet-ring cell in 1, 
undetermined type after neoadjuvant treatment in 1) and squamous cell carcinoma in 1. By 
immunohistochemistry, the adenocarcinomas were CK7 (45%), CK20 (89%), CK903 (78%), 
CDX2 (89%), SATB2 (67%), and beta-catenin (100%) positive. GATA-3 was negative in all cases. 
Pathologic stage was T1 (30%), T2 (40%), T3 (20%), and T4 (10%). Regional lymph node and
distant metastasis were present in 60% and 20%, respectively. Treatment included multimodality therapy in most patients. On follow-up (mean, 27.4 months), 2 patients were dead (1 of disease), 3 were alive with disease, 4 were alive without disease, and 2 were lost to follow-up.

Secondary malignancy arising within urologic reconstruction is rare, most frequently has adenocarcinoma morphology, presents late, and behaves aggressively.

**Keywords**

Adenocarcinoma; Augmentation cystoplasty; Ileal conduit; Bladder; Urologic reconstruction

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1. **Introduction**

Urinary tract reconstructive surgery, such as urinary diversion and reconstruction cystoplasty, requires juxtaposition of urinary and intestinal mucosa. Depending on the severity of the congenital abnormality or malignancy, patients may undergo different procedures, ranging from augmentation cystoplasty to cystectomy with urinary diversion. Augmentation cystoplasty is a procedure performed to increase the compliance and size of the bladder, utilizing components of the gastrointestinal (GI) tract. The most commonly used tissue is a segment of the terminal ileum, but the stomach and colon may also be used [1]. Urinary diversion is typically performed after cystectomy and can be broadly classified into incontinent and continent procedures, incorporating portions of the GI tract. Continent diversions include cutaneous diversions and orthotopic neobladders. Incontinent diversions include cutaneous ureterostomy, ileal conduit, and sigmoid conduit. Increased incidence of secondary malignancy arising from intestinal mucosa within these reconstructive procedures is well known and estimated to occur in 0.18%–15% of patients undergoing urinary diversion, more frequently ureterosigmoidostomies and cystoplasties [2]. However, data regarding the clinicopathologic features of these malignancies are scant. This study aims to describe the clinicopathological features of secondary tumors arising after urologic reconstruction procedures.

2. **Materials and methods**

A search was conducted in the pathology files of the collaborating academic institutions. Cases of secondary malignancy arising in the reconstruction or diversion were included. If the reconstruction was performed for urothelial carcinoma, recurrence of this tumor within the reconstructed tract was excluded. Clinicopathologic data were collected, and staging was retrospectively assigned based on the GI segment included in the reconstruction according to the AJCC 8th edition. Immunohistochemical stains for CK7 (PA0942 Bond RTU, Leica, Buffalo Grove, IL), CK20 (PA0022 Bond RTU, Leica, Buffalo Grove, IL), CK903 (PA0134 Bond RTU, Leica, Buffalo Grove, IL), GATA-3 (PA0798 Bond RTU, Leica, Buffalo Grove, IL), SATB2 (384R-18 RTU, Cell Marque (Sigma/Millipore), Rocklin, CA), CDX2 (PA0375 Bond RTU, Leica, Buffalo Grove, IL), and beta-catenin (Cat. 9582, Cell Signaling, Beverly, MA, 1:200) were performed on a Leica Bond-Max immunostainer (Leica Biosystems, Buffalo Grove, IL) on a representative tumor slide in 9 of 10 cases of adenocarcinomas and were scored on a scale from 0 to 3+. Focal expression was defined as <50% of tumor...
expression. The slides were reviewed by the primary author, a pathology trainee (C. C.), a genitourinary pathologist (G. A. G.), and a GI pathologist (S. N. S.).

The study was approved by the Vanderbilt Institutional Review Board (#201148, 6/13/22).

3. Results

A total of 11 cases were identified, including 7 ileal conduits, 2 gastrocystoplasties, 1 augmentation cystoplasty, and 1 Indiana pouch (Table 1). The mean age was 51.7 years (range: 29–70). The male-to-female ratio was 8:3. History of tobacco use was present in 3 patients and neurogenic bladder in 2. Prior history of bladder cancer included urothelial carcinoma (1 patient) and leiomyosarcoma (1 patient), whereas other unrelated cancer history included acute lymphoblastic leukemia (1 patient), squamous cell carcinoma of the lip (1 patient), prostatic adenocarcinoma (1 patient), and prostatic and renal cell carcinoma (1 patient). None of these patients had history of GI malignancy. Reconstruction was for benign disease in 8 of 11 (73%) patients, malignancy in 2 of 11 (18%), and for unknown reason in 1 of 11 (9%). Median time from reconstruction to malignancy was 36 years (range: 2–58). Secondary malignancy was adenocarcinoma in 10 patients and squamous cell carcinoma in 1. Malignancy arose within the reconstructed intestinal segment in all adenocarcinoma cases and within the ileal conduit at the level of the right lower quadrant urostomy in the patient with squamous cell carcinoma. In the patients with adenocarcinoma, subtypes were intestinal in 6 (Fig. 1A), gastric in 2 (Fig. 2A), and signet-ring cell in 1 (Fig. 3A). One case had an undetermined phenotype due to significant neoadjuvant treatment effect. The squamous cell carcinoma, arising within the stoma site of an ileal conduit, was well differentiated and keratinizing. Immunohistochemical analysis showed the following expression: CK7 (4 of 9, 45%), CK20 (8 of 9, 89%, 4 focal), CK903 (7 of 9, 78%, all focal), CDX2 (8 of 9, 89%, 2 focal), SATB2 (6 of 9, 67%, 3 focal), beta-catenin (9 of 9, 100%, all membranous and cytoplasmic, and 4 nuclear) (Fig. 1B-F, 2B-F, 3B-F). GATA-3 was negative in all stained cases. Cases 4 and 9 were not stained. Case 4 was a squamous cell carcinoma, and case 9 had only recent biopsy material, which was preserved for possible future diagnostic ancillary studies (see Table 2).

Pathologic stage could be obtained in 10 of 11 (91%) cases. Stage was pT1 in 3 of 10 (30%), pT2 in 4 of 10 (40%), pT3 in 2 of 10 (20%), and pT4 in 1 of 10 (10%). Regional lymph node metastasis was present in 6 of 10 (60%), whereas distant metastasis was present in 2 of 10 (20%).

Treatment included surgery alone (4 of 11, 36%), chemotherapy alone (1 of 11, 9%), surgery and chemotherapy (4 of 11, 36%), chemotherapy and radiation (1 of 11, 9%), and radiation with immunotherapy (1 of 11, 9%).

Information on microsatellite instability status (MSI) and mismatch repair protein expression was available in 4 and 1 patients, respectively, and showed MSI-stable tumors and no immunohistochemistry (IHC)-deficient pattern. Tumor sequencing was carried out in 3 patients, revealing MAP2K1, CDKN2A, IGF2, NOTCH2, TP53, ZNF217 (patient 6) and KRAS (G13D), ASXL1, and GNAS (patient 7) alterations in 2 patients with
gastrocytoplasty. TOP2A, RET, and mTOR alterations were identified in 1 patient with an ileal conduit performed for diabetes insipidus and bladder dysfunction in childhood (patient 9).

PD-L1 was tested in 2 patients, resulting in expression in 1 (patient 7), while negative in the other (patient 9).

Systemic therapy was administered in 7 patients. Three patients received neoadjuvant FOLFOX (patients 5, 6, and 7). Patients 6 and 7 additionally received trastuzumab and adjuvant carboplatin and paclitaxel, pembrolizumb, and irinotecan, respectively. Radiation and pembrolizumab, palliative FOLFOX followed by FOLFIRI, and radiation with FOLFIRINOX were administered to patients 8, 9, and 3, respectively. Patient 10 received FLOX + pazopanib upon development of metastatic disease.

Follow-up was available for 9 of 11 cases (mean follow-up time: 27.4 months, range: 7–82). Of 6 patients with intestinal-type adenocarcinoma, 1 was lost to follow-up, 1 died of disease, 2 were alive with disease, and 2 were alive without disease. Both patients with gastric-type adenocarcinoma were alive, 1 with and 1 without disease. The patient with adenocarcinoma with signet-ring cell features was lost to follow-up, and the patient having significant treatment effect was alive without disease. One patient with squamous cell carcinoma died of unknown cause.

4. Discussion

Cystectomy with urinary diversion is the recommended gold standard treatment for patients with muscle-invasive bladder cancer [3]. In patients with bladder dysfunction or anatomic abnormalities, bladder augmentation represents a possible treatment strategy to decrease bladder pressure and preserve continence. Cystectomy with diversion is also an option for these patients. The first widely used reconstruction technique was ureterosigmoidostomy. However, renal and metabolic complications are frequent with this procedure. Furthermore, an increased risk of secondary malignancy, including adenocarcinoma at the ureter-colon anastomosis, is a well-known complication occurring after 20 years and has limited the use of this procedure. It has been hypothesized that carcinoma development is associated with the presence of feces and urine within urothelial and rectal mucosa [4]. Although secondary malignancy in uretersigmoidostomies has been well described, this is not the case in other urinary diversion methods.

Urinary reconstruction procedures can be classified based on continence and type of GI tissue used. Ileal conduits, gastrocystoplasties, and Indiana pouch were included in this study. An ileal conduit is the most widely used method of urinary diversion [5]. In this procedure, a neobladder is formed from a portion of ileum, to which the ureters are directly affixed. This new reservoir is then drained through the abdominal skin via a stoma. Gastrocystoplasty is a form of urinary bladder augmentation used in patients unable to tolerate augmentation using colon or small bowel segments due to renal insufficiency or short bowel syndrome [6]. In this procedure, a portion of the stomach, usually a wedge from the body, is sewn as a patch onto the opened bladder, creating a larger reservoir for urine.
This procedure has many well-documented complications, most notably metabolic alkalosis and hematuriakidysuria syndrome [7]. An Indiana pouch is a continent urinary diversion option that utilizes the cecum and terminal ileum. The cecum acts as the urine reservoir, and the terminal ileum is brought to the skin surface via stoma, where it acts as a catheterizable channel [8].

A long latency period between bladder augmentation/urinary diversion and secondary malignancy with times ranging between 2 and 32 years depending on the type of procedure performed has been described [2,9,10]. In our case series, the average time to malignancy was 36 years (range: 2–58). Previous studies have shown that the most common histologic type is adenocarcinoma, which is usually poorly differentiated with signet-ring cell morphology and presents at an advanced pathologic stage [10,11]. Most of the malignancies in our series were moderately differentiated adenocarcinomas, with only one demonstrating signet-ring cell features. However, presentation at an advanced stage and regional and distant metastases are consistent with prior studies. Of note, some previous studies did not report on the immunohistochemical staining patterns of these tumors. In our case series, 8 of 9 adenocarcinomas were positive for CDX2 and CK20 (the latter was negative, as expected, in a tumor arising within gastric mucosa) and 6 of 9 were positive for SATB2. CK903 showed limited positivity in all cases, ranging from 0% to 30%. Membranous and cytoplasmic beta-catenin stain was present in all cases, while four cases (three intestinal-type and one gastric-type) had nuclear staining. GATA-3 was negative in all cases. This immunophenotype is consistent with GI origin, as expected in these tumors arising within reconstructed intestinal mucosa. In this cohort, a primary malignancy was the reason for a reconstruction procedure in 2 patients: patients 3 and 10, who underwent reconstruction for urothelial carcinoma and leiomyosarcoma of the bladder, respectively. The secondary malignancy in these two patients was an adenocarcinoma, which is morphologically dissimilar from the reported primary malignancies, a lymphoepithelioma-like urothelial carcinoma and a leiomyosarcoma of the bladder, respectively. None of our patients had a history of GI primary. Furthermore, the secondary malignancy arose within the reconstructed intestinal tract in all cases. Although it is theoretically possible that the primary malignancy could have recurred in the form of divergent differentiation (adenocarcinoma) in patient 3, immunohistochemistry to distinguish these two possibilities would not have been discerning, as a primary bladder adenocarcinoma would still acquire an intestinal-type immunohistochemical phenotype. In other words, a primary adenocarcinoma arising from, for example, the bladder may be CDX2 and SATB2 positive [12] and may typically lose GATA3 expression. Thus, diagnosis of primary origin, in this setting, should be made clinically. Based on these considerations and origin within the reconstructed tract in all cases, we are confident that these malignancies were secondary and not a recurrence of the patient’s primary disease.

As noted earlier, as the risk of secondary malignancy in ureterosigmoidostomies became recognized, the procedure faded in popularity in favor of ileostomy and various reconstructions utilizing portions of the stomach, small intestine, and bowel. The most recognized mechanism for secondary malignancy in ureterosigmoidostomies is the simultaneous interaction of feces and urine with urothelium and rectal mucosa. Thus, ureterosigmoidostomies have become essentially obsolete in favor of techniques with fewer
side effects. The latter reconstruction procedures, including ileal conduit, gastrocystoplasty, and Indiana Pouch, do not allow for mixing of feces and urine. However, as secondary malignancy arising from the engrafted mucosa in these newer procedures has also been reported, with more variability in tumor type [2,9,11], other mechanisms for carcinogenesis have been proposed. Theories have included urine as the primary driver of carcinogenesis, inflammation at the anastomotic site, and local prostaglandin formation [2,9]. However, the exact mechanism of carcinogenesis remains elusive in light of these tumors’ rarity and long latency, making retrospective and prospective studies challenging. The well-described adenoma-carcinoma sequence is a commonly hypothesized mechanism of tumorigenesis in ureterosigmoidostomies [2,9]. In this mechanism, mutations accumulate over several years as the tumor advances from normal colon to adenocarcinoma. The most common initial mutation involves inactivation of both APC gene alleles. Inactivation of APC allows beta-catenin to accumulate in the cell and active transcription of genes that promote proliferation, such as MYC and Cyclin-D1. Even without mutations in APC, cells with mutations in beta-catenin can similarly promote unregulated proliferation. The accumulation of additional abnormalities, such as mutation of KRAS, SMAD2 and SMAD4 loss, and TP53 inactivation, leads to marked chromosomal instability and carcinogenesis [13,14]. The interaction of urine and feces at the anastomotic sites in ureterosigmoidostomies is thought to be the driver of these mutations. Additionally, latency period has been shown to vary depending on the initial reason for cystectomy. Patients with malignant diagnoses have shorter induction periods than those undergoing cystectomy for benign conditions [2,9]. This trend is similarly demonstrated in our case series (see Table 1). Literature describing the genetic alterations in these tumors is limited, although genetic instability at anastomotic sites has been demonstrated [11]. A prior case series found alterations in beta-catenin and ERBB4 in adenocarcinomas arising from gastrocystoplasties and KIT and KRAS mutations in ileostomies [15]. In our study, all three patients with available molecular data, underwent procedures for benign conditions and had extended latency periods (20+ years) from surgery to secondary malignancy. Cases 6 and 7, both with adenocarcinoma arising in a gastrocystoplasty, harbored alterations in MAP2K1, CDKN2A, IGF2, NOTCH2, TP53, and ZNF217, (case 6) and KRAS (G13D), ASXL1, and GNAS (case 7), respectively. Mutations of TP53, KRAS, and MAPK have been described in sporadic gastric adenocarcinomas arising in the native stomach. Case 9, adenocarcinoma arising in an ileal conduit, showed alterations in KRAS, TP53, KMT2C, and ASXL1. Mutations in adenocarcinomas from the small bowel are less well understood compared with those in the colon. The majority of sporadic tumors are thought to progress along a similar adenoma-carcinoma sequence, although involvement of the APC/beta-catenin pathway is less common. Alterations in TP53 and KRAS have been described, as well as generalized chromosomal instability resulting in multiple gains and losses of chromosomes [16]. Although data regarding the genetic profiles of the tumors in this case series are limited, the presence of multiple genetic alterations over long latency periods suggests a gradual accumulation similar to that seen in the adenoma-adenocarcinoma sequence.

Limitations of our study included retrospective analysis and relatively small sample size with lack of very detailed long-term follow-up information in a subset of patients, which restricts more granular outcome investigation, such as cancer-specific survival, proportional...
hazard analysis with multivariable Cox regression, and controlling for the effect of adjuvant therapy. Furthermore, given the variable source organs and types of augmentation, whether these tumors should be staged remains to be determined. These protocols may be sufficient for pathologic staging in patients with neobladders formed entirely with a single tissue type. However, the proper staging criteria for bladder augmentations that combine urinary and GI mucosa are unclear. The biological behavior and relevant prognostic factors are yet to be determined owing to the relative rarity of these tumors.

5. Conclusions

Overall, secondary malignancy arising after urologic reconstruction procedures is rare and has only recently emerged owing to the routine use of bladder augmentation procedures. It presents after long latency at advanced pathologic stages and more frequently with adenocarcinoma morphology owing to the frequent use of intestinal mucosa. The authors anticipate further advances in understanding both clinical and histopathologic characteristics of these tumors with larger multi-institutional studies and molecular analysis.

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References


Fig. 1.
A) Adenocarcinoma, intestinal type (magnification, X40). The tumor is CK7 negative (B), very focally, weakly CK20 positive (C), CDX2 positive (D), SATB2 negative (E), and positive for beta-catenin with a cytoplasmic, membranous, and nuclear pattern (F) (magnification, X200).
Fig. 2.
A) Adenocarcinoma, gastric type. The tumor is CK7 positive (B), CK20 negative (C), focally CDX2 positive (D), SATB2 negative (E) (magnification, X100), and positive for beta-catenin with a cytoplasmic pattern (F) (magnification, X400).
Fig. 3.
A) Adenocarcinoma with focal signet-ring cell features. The tumor is CK7 negative (B), patchy CK20 positive (C), CDX2 (D) and SATB2 positive (focal) (E), and positive for beta-catenin with a membranous and cytoplasmic pattern (F) (magnification, X200).
### Clinical features of the patients’ cohort.

<table>
<thead>
<tr>
<th>Case</th>
<th>Age/Gender</th>
<th>Race/Ethnicity</th>
<th>Reconstruction</th>
<th>Primary Disease</th>
<th>Time to Disease (years)</th>
<th>Specimen Type</th>
<th>Stage</th>
<th>Treatment</th>
<th>Follow-up (months)</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60/M</td>
<td>NA</td>
<td>Ileal conduit</td>
<td>Bladder exstrophy</td>
<td>40</td>
<td>Resection</td>
<td>pT4N1</td>
<td>Surgery</td>
<td>7</td>
<td>AWOD</td>
</tr>
<tr>
<td>2</td>
<td>53/F</td>
<td>White</td>
<td>Ileal conduit</td>
<td>Vesicoureteral reflux</td>
<td>48</td>
<td>Resection</td>
<td>pT1Nx</td>
<td>Surgery</td>
<td>48</td>
<td>AWOD</td>
</tr>
<tr>
<td>3</td>
<td>58/F</td>
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<td>Urothelial carcinoma</td>
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<td>Resection</td>
<td>T3Nx</td>
<td>Chemotherapy Radiation</td>
<td>82</td>
<td>AWOD</td>
</tr>
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<td>White</td>
<td>Ileal conduit</td>
<td>Bladder exstrophy</td>
<td>58</td>
<td>Resection</td>
<td>pT2N2b</td>
<td>Surgery</td>
<td>7</td>
<td>DOU</td>
</tr>
<tr>
<td>5</td>
<td>38/M</td>
<td>White</td>
<td>Ileal conduit</td>
<td>Obstructive uropathy s/p kidney transplant</td>
<td>36</td>
<td>Resection</td>
<td>pT2N2</td>
<td>Surgery Chemotherapy</td>
<td>9.5</td>
<td>LTF</td>
</tr>
<tr>
<td>6</td>
<td>36/M</td>
<td>White</td>
<td>Gastrocystoplasty</td>
<td>Reflux nephropathy s/p kidney transplant</td>
<td>24</td>
<td>Resection</td>
<td>pT3aN2</td>
<td>Surgery Chemotherapy</td>
<td>8.5</td>
<td>DOD</td>
</tr>
<tr>
<td>7</td>
<td>29/M</td>
<td>White</td>
<td>Gastrocystoplasty</td>
<td>Renal dysplasia</td>
<td>26</td>
<td>TURBT</td>
<td>pT2N3M1</td>
<td>Surgery Chemotherapy</td>
<td>18</td>
<td>AWD</td>
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<tr>
<td>8</td>
<td>50/F</td>
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<td>Colo-cystoplasty converted to ileal conduit</td>
<td>End-stage bladder s/p chemotherapy</td>
<td>44</td>
<td>Biopsy</td>
<td>pT1NxM1</td>
<td>Radiation Immunotherapy</td>
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<td>AWD</td>
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<td>Biopsy</td>
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<td>Chemotherapy</td>
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<td>Indiana pouch</td>
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<td>24</td>
<td>LTF</td>
</tr>
<tr>
<td>11</td>
<td>57/M</td>
<td>NA</td>
<td>Augmentation cystoplasty</td>
<td>NA</td>
<td>NA</td>
<td>Resection</td>
<td>pT1Nx</td>
<td>Surgery</td>
<td>63</td>
<td>AWOD</td>
</tr>
</tbody>
</table>

**Abbreviations:** NA, not available; AWOD, alive without disease; AWD, alive with disease; DOU, died of unknown cause; DOD, died of disease; LTF, lost to follow-up.
Table 2
Histologic and immunohistochemical characteristics of the patients’ cohort.

<table>
<thead>
<tr>
<th>Case</th>
<th>Reconstruction</th>
<th>Histology</th>
<th>Type</th>
<th>Differentiation</th>
<th>CDX2</th>
<th>SATB2</th>
<th>Beta-catenin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>% Tumor positive</td>
<td>Intensity</td>
<td>% Tumor positive</td>
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<td>Gastric</td>
<td>Moderately differentiated</td>
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<td>2+</td>
<td>60</td>
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<td>Ileal conduit</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/Villous</td>
<td>Well-differentiated</td>
<td>80</td>
<td>3+</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>Ileal conduit</td>
<td>Treatment effect</td>
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<td>NA</td>
<td>100</td>
<td>3+</td>
<td>100</td>
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<tr>
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<td>Squamous cell carcinoma</td>
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<td>Well-differentiated</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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<tr>
<td>5</td>
<td>Ileal conduit</td>
<td>Adenocarcinoma with signet ring features</td>
<td>Signet ring features</td>
<td>Poorly differentiated</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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<tr>
<td>6</td>
<td>Gastrocystoplasty</td>
<td>Adenocarcinoma intestinal type</td>
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<td>Poorly differentiated</td>
<td>100</td>
<td>3+</td>
<td>100</td>
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<td>100</td>
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<td>8</td>
<td>Colo-cystoplasty converted to ileal conduit</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/Villous</td>
<td>Well-differentiated</td>
<td>100</td>
<td>3+</td>
<td>100</td>
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<td>Ileal conduit</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/Villous</td>
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<td>100</td>
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<td>Indiana pouch</td>
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<td>Intestinal/Villous</td>
<td>Poorly differentiated</td>
<td>100</td>
<td>3+</td>
<td>100</td>
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<td>11</td>
<td>Augmentation cystoplasty</td>
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<td>Intestinal/Villous</td>
<td>NA</td>
<td>100</td>
<td>3+</td>
<td>100</td>
</tr>
<tr>
<td>Case</td>
<td>Reconstruction</td>
<td>Histology</td>
<td>Type</td>
<td>Differentiation</td>
<td>CDX2 % Tumor positive</td>
<td>SATB2 % Tumor positive</td>
<td>Beta-catenin % Tumor positive</td>
</tr>
<tr>
<td>------</td>
<td>----------------</td>
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<td>------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Gastrocystoplasty</td>
<td>Adenocarcinoma intestinal type</td>
<td>Intestinal</td>
<td>Poorly differentiated</td>
<td>10</td>
<td>2+</td>
<td>0</td>
</tr>
<tr>
<td>7</td>
<td>Gastrocystoplasty</td>
<td>Adenocarcinoma gastric type</td>
<td>Gastric</td>
<td>Well-differentiated</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>Colo-cystoplasty converted to ileal conduit</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/villous</td>
<td>Well-differentiated</td>
<td>90</td>
<td>3+</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Ileal conduit</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/villous</td>
<td>Well-differentiated</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>10</td>
<td>Indiana pouch</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/villous</td>
<td>Poorly differentiated</td>
<td>100</td>
<td>3+</td>
<td>100</td>
</tr>
<tr>
<td>11</td>
<td>Augmentation cystoplasty</td>
<td>Adenocarcinoma intestinal/villous type</td>
<td>Intestinal/villous</td>
<td>NA</td>
<td>100</td>
<td>3+</td>
<td>60</td>
</tr>
</tbody>
</table>

Abbreviations: M, membranous; C, cytoplasmic; N, nuclear.