AUA Update Series 2020
Lesson 25 Volume 39

Urinary Diversion for Benign Indications*

Learning Objective: At the conclusion of this continuing medical education activity, the participant will be able to identify the common indications for cystectomy and urinary diversion in benign settings, and be prepared to make appropriate patient selection and obtain the appropriate preoperative diagnostic studies. The participant will be able to describe the various urinary diversion options, postoperative considerations and long-term follow-up regimen.

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***This AUA Update addresses the Core Curriculum topic of Neurogenic Bladder and the American Board of Urology Modules on Neurogenic Bladder, Voiding Dysfunction, Female Urology, BPH and Urethral Stricture and Oncology, Urinary Diversion and Adrenal.**

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Release date: August 2020

Expiration date: August 2023

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Key Words: cystectomy; urinary diversion; urinary bladder, neurogenic; radiation injuries

INTRODUCTION

Urinary diversion with or without cystectomy is generally considered the last step in the management of patients with non-malignant lower urinary tract dysfunction. While some patients and physicians may be hesitant to take this step, it is sometimes necessary to proceed when the bladder is not salvageable and is causing diminished quality of life. **Urinary diversion has excellent long-term outcomes and is a safe and reliable option in the appropriately selected patient.** This Update reviews common indications for benign urinary diversion, preoperative evaluation, diversion choice, postoperative considerations and outcomes.

URINARY DIVERSION FOR NON-MALIGNANT INDICATIONS

Common indications. Cancer Survivors: Improvements in cancer care are leading to a growing number of cancer survivors, with a population projected to exceed 24 million by 2024.[1] Up to 40% of these patients will undergo pelvic radiation for urological, colorectal and gynecologic malignancies.[2] Innovations in radiation treatment planning and targeting, such as intensity modulated radiation, may minimize damage to normal tissues but devastating genitourinary injuries still occur in about 3% of patients.[3, 4] While there are conservative measures to treat most radiation injuries, some will still require urinary diversion.

The "trifecta" of severe radiation cystitis, bladder neck contracture and urinary incontinence is a strong indication for urinary diversion as the likelihood of successful reconstruction is low.[5–7] Radiation cystitis alone, when refractory to all other measures, may also require cystectomy with urinary diversion.[8]

Many fistulas resulting from cancer treatments can be repaired primarily but some may require urinary diversion.[9] **We recommend a stepwise pathway for evaluating and managing rectourethral fistula, and generally reserve cystectomy with urinary diversion for those patients with a combination of a very large defect (>3 cm) along with prior radiation therapy, as these are considered unrepairable.**[10] Similarly some radiation induced vesicovaginal, colovesical and colovaginal fistulas can be repaired surgically but many are best managed by urinary diversion or total pelvic exenteration.[11]

Prostate cancer survivors treated with radiation and subsequent bladder neck procedures are at risk for urosymphyseal fistula, often with associated pubic osteomyelitis.[12–14] These patients require cystectomy with urinary diversion and removal of the infected bone to achieve source control of the osteomyelitis and pain relief.[15] **This syndrome should be considered in any patient being evaluated for cystectomy due to radiation injury to the bladder, and MRI should be obtained when these patients endorse any associated pubic bone tenderness, pain with ambulation or thigh/groin abscesses.**[16] An example of a urosymphyseal fistula tract and bone debridement is shown in figure 1.

Neurogenic Bladder: In patients with neurogenic bladder the primary goals of protecting the upper urinary tract and maximizing quality of life can generally be achieved without urinary diversion.[17] Medical therapies including bladder relaxant medications such as anticholinergics, beta3-agonists or intravesical botulinum toxin injections along with intermittent catheterization are considered first line therapy for patients with impaired compliance. When surgical intervention is indicated, bladder augmentation and catheterizable channel formation are more commonly performed than urinary diversion to manage patients with poor compliance despite medical therapy, although this is not always an option.[18]

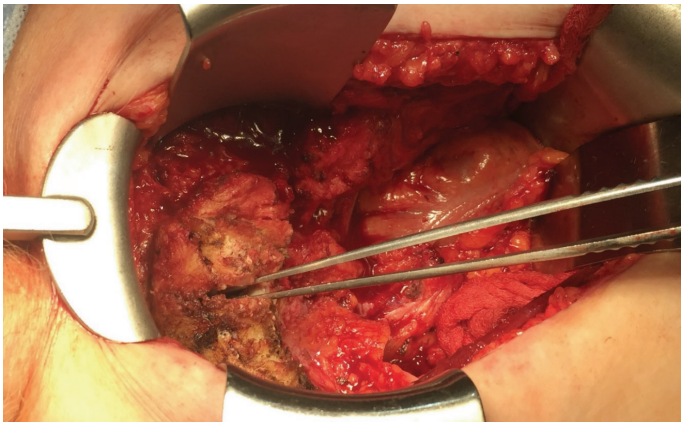

Figure 1. Bone debridement and urosymphyseal fistula tract in patient with pubic osteomyelitis.

Urinary diversion can be considered in patients requiring surgical intervention who have cognitive impairment, inability to self-catheterize or progressive upper urinary tract damage despite alternative treatments. **Most commonly urinary diversion for neurogenic bladder is performed in patients with spinal cord injury, who may have limited ability to self-catheterize.**[19]

Interstitial Cystitis/Bladder Pain Syndrome: IC/BPS can cause severe urinary symptoms and pain associated with diminished quality of life. Numerous treatment options can be attempted in a stepwise fashion before considering major surgery for this condition.[20] Extensive counseling is recommended regarding realistic outcomes and expectations for patients considering urinary diversion for IC/BPS. **While urinary symptoms such as frequency and urgency can be addressed with urinary diversion, pelvic pain may persist following cystectomy, and patients may even experience pouch pain in addition to frequent postoperative infections.**[21, 22] Cystectomy with urinary diversion should be undertaken in this population only after an extensive counseling and informed consent process.

Other Indications: Less common indications for urinary diversion in benign conditions include severe/refractory urinary incontinence, urethral stricture disease and impaired contractility.[19]

ABBREVIATIONS: BMI (body mass index), BMP (basic metabolic panel), CT (computerized tomogram), ERAS (enhanced recovery after surgery), HRQOL (health related quality of life), IC/BPS (interstitial cystitis/bladder pain syndrome), MRI (magnetic resonance imaging)

Effect of urinary diversion on quality of life. Health related quality of life considerations are of critical importance in patients with non-malignant conditions undergoing elective urinary diversion. Unfortunately studies on HRQOL specifically focusing on this patient population are limited. In a series of 19 patients undergoing cystectomy with urinary diversion for severe radiation injuries (including radiation cystitis, rectourethral fistula, vesicovaginal fistula, chronic pelvic pain and bladder neck contracture/incontinence) preoperative assessment revealed significantly impaired HRQOL domain scores relative to the national average.[23] **Following surgery significant improvements were observed in specific HRQOL variables of pain, general health, emotional well-being and social functioning**. Cumulative physical and mental health domain scores also improved significantly with urinary diversion.

HRQOL outcomes were reported in a series of 48 patients undergoing urinary diversion for neurogenic bladder.[24] Questionnaires validated to assess HRQOL issues among patients with spinal cord injury or multiple sclerosis were administered preoperatively and postoperatively. **Following ileal conduit urinary diversion there was significant improvement in the perceived limitations and constraints imposed by urinary problems, as well as the Specific Impact of Urinary Problems index, a measure of the impact of urinary problems on quality of life.** However, there was no change in overall HRQOL.

Regarding HRQOL and urinary diversion type, studies have focused mainly on comparing ileal conduit to orthotopic neobladder among patients undergoing cystectomy for cancer. The orthotopic neobladder is rarely considered in the benign setting as the outlet often is not usable because of prior surgery or radiation therapy, but can be effective in select patients. A meta-analysis of HRQOL studies demonstrated slightly higher scores among younger and fitter patients undergoing neobladder vs ileal conduit.[25] **However, patient satisfaction and body image appear similar between diversion types after 2 years,[26] which significantly increases the options for treatment of these patients to include non-continent and continent diversions when indicated.** Overall health, relationships and finances were observed to be the most important determinants of patient satisfaction, whereas body image and diversion type were not.[27]

Patient selection and preoperative considerations. Nutritional Status: Malnutrition is present in 16%-55% of patients undergoing cystectomy for malignancy and has been identified as a risk factor for surgical complications.[28–30] While the incidence of malnutrition among patients undergoing cystectomy for benign indications has not been reported, this condition is likely common and warrants attention before proceeding with elective surgery. Malnutrition can be identified by the presence of at least 2 clinical factors, including insufficient intake, unintentional weight loss, loss of muscle mass, loss of subcutaneous fat, fluid accumulation and diminished functional status.[31] Serum proteins such as albumin and prealbumin are easy to obtain but emerging evidence suggests that these tests are less reliable than clinical assessment. **However, albumin less than 3.5 ng/dl has been observed to increase the odds of postoperative mortality following cystectomy for malignancy.[29, 30]** In our practice hypoalbuminemia is a contraindication to elective surgery and would need to be corrected before undertaking an operation.

If malnutrition is identified, consultation with a dietician may identify areas for focused improvement before surgery. Preoperative carbohydrate loading is safe and effective, although an associated improvement in outcomes has not been observed.[32] **Many ERAS protocols from the oncology literature include preoperative optimization of diet, which entails increased protein and carbohydrate intake, although again the specific impact on outcomes has not been assessed.**[33–35]

Obesity: As obesity rates increase around the world, we are encountering patients with ever higher BMIs. High BMI is a known risk factor for complications such as parastomal hernia and BMI should be optimized prior to an elective intervention.[36] With input from our plastic surgery colleagues we generally use a BMI of 35 as the upper allowable limit before proceeding with urinary diversion. This cutoff can serve as a motivator to encourage patients to increase their activity levels and improve diet, which facilitates a safer operation while improving overall health.

Mobility and Deconditioning: Mobility may be impaired in this patient population, particularly those undergoing urinary diversion for neurogenic bladder. Appropriate deep venous thrombosis prophylaxis is recommended preoperatively and during recovery. **A total of 28 days of perioperative prophylaxis with enoxaparin has been observed to reduce deep venous thrombosis rates with no increased risk of bleeding after cystectomy for malignancy.[37]** This practice should be considered in the benign population as well, although the effect has not been studied.

Preoperative deconditioning and frailty are common among cancer survivors and are known to increase the risk of complications in patients undergoing cystectomy for malignancy.[38] **A randomized controlled trial in this population indicated that multimodal "prehabilitation," including exercise, nutritional change and stress relief techniques improves postoperative functional recovery, measured at 4 weeks after surgery.[39]**

Radiation Changes: Prior pelvic radiation can pose unique challenges for the surgeon planning cystectomy and urinary diversion. The combination of prior pelvic surgeries and pelvic radiation can lead to considerable adhesions of the small bowel in the pelvis.[11] Great care must be taken when opening the abdomen and gaining initial exposure. The radiated small bowel is fragile, and sharp dissection should be preferred over blunt dissection to minimize risk of enterotomy.

Pelvic radiation can compromise blood supply to the distal ureters and lead to ureteral stricture.[40] In patients with preoperative ureteral stents in place to manage ureteral obstruction conversion to a nephrostomy tube and removal of the stent are recommended at least 4 weeks before surgery. This will decrease inflammation and aid in identifying the healthy portion of the ureter. We recommend ligating the ureters around the level of the iliac vessels, as the ureter distal to this point is often damaged. Careful ureterolysis is needed and can generally be achieved by identifying a plane directly on the ureter and under a fibrous, radiation induced capsule. **Before implanting the ureters into the urinary diversion we often perform diagnostic ureteroscopy to assess the quality of the ureteral mucosa and ensure that the ureter has been transected proximal to the level of radiation changes.** The mucosa is directly visualized, and additional ureter is resected if needed until healthy, pink mucosa is seen.

PREOPERATIVE DIAGNOSTIC EVALUATION

Radiological evaluation. Most patients treated with diversion

will undergo preoperative axial imaging. In the rare instance that there is no preoperative imaging we recommend at least a renal ultrasound to assess for hydronephrosis suggestive of upper tract obstruction. There is new evidence that microbubble ultrasound contrast agents can be added to conventional ultrasound to assess for ureteral patency in patients with a nephrostomy tube in place.[41] If there is any worry about obstruction, the patient would benefit from axial imaging to assess for underlying pathology.

The majority of patients undergoing diversion should undergo computerized tomography to define the abdominal and pelvic anatomy. Non-contrast CT, as a way to minimize radiation or contrast load, can provide information about hydronephrosis, ureterectasis and bowel pathology, and can even identify stones that may require intervention before or during urinary diversion. **If renal function allows, the delayed images during the excretory phase of CT urography will easily identify abnormal renal or ureteral pathology such as duplication or obstruction, as well as the location of the pathology.** In cases where the function of 1 renal moiety is in question a renal perfusion scan can be helpful to determine the relative benefits of simple nephrectomy.

Triphasic CT has an effective radiation dose of 14.8 mSv. MRI provides an alternative imaging modality to limit radiation exposure and can be used in patients with contrast allergy or renal insufficiency.[42] **MRI also serves an important role in the diagnosis of pubic osteomyelitis in the prostate cancer survivor and should be considered in any patient with significant pubic pain, difficulty ambulating, or recurrent urinary tract infections or abscesses.**[16] Findings suggestive of pubic osteomyelitis include high signal on T2-weighted images, low signal on T1-weighted images and presence of regional myositis (fig. 2). If there is concern for pubic osteomyelitis, the patient should undergo bone debridement during diversion to alleviate pain and achieve infectious source control.[13] Our algorithm for assessing and treating radiation injuries to the bladder is shown in figure 3.

Further diagnostic tests. Other non-radiographic tests may help with surgical planning for urinary diversion or with choosing an alternative operation. Our institution uses preoperative videourodynamics in the majority of patients undergoing benign cystectomy and diversion to determine if the bladder is salvageable or truly requires removal. For example fluoroscopic evidence of a closed bladder neck with a high pressure, non-compliant neurogenic bladder may make augmentation an option instead of urinary diversion, such as in prostate cancer survivors with bladder neck stricture. Another example is a patient who is incontinent secondary to intrinsic sphincter deficiency, who may benefit from bladder neck reconstruction only. In instances where we find a fixed, open bladder neck with stricture in patients with radiation cystitis causing low capacity or detrusor overactivity, videourodynamics can also help determine the need for urinary diversion.[43]

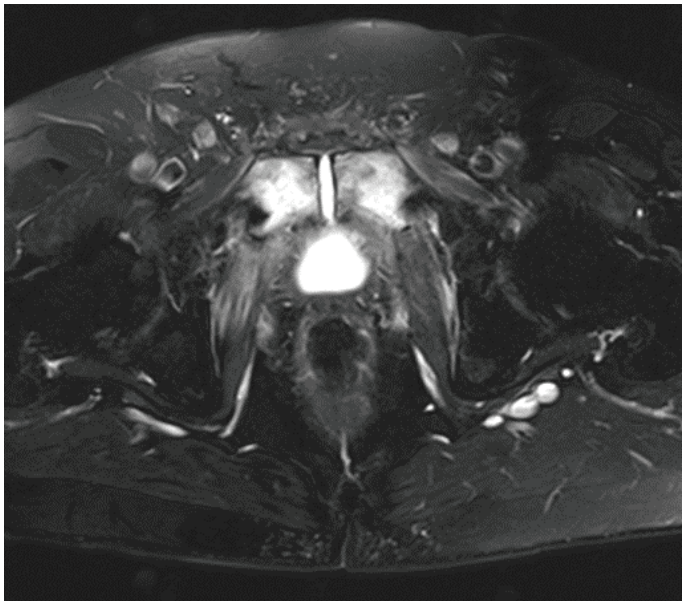

Figure 2. T2-weighted MRI demonstrates urosymphyseal fistula and osteomyelitis.

Patients with significant radiation history may have ureteral strictures necessitating percutaneous nephrostomy tube placement. Antegrade nephrostogram either before diversion or during surgery can help delineate the level of healthy ureter and guide dissection.

Another very important preoperative diagnostic test if considering a colon conduit or right colon pouch continent diversion is colonoscopy in patients of screening age. If there is concern for carcinoma or bowel disease, this should be evaluated prior to diversion.

CHOOSING THE RIGHT DIVERSION: SPECIAL CONSIDERATIONS

Urinary diversions can differ in many ways, eg continent vs non-continent and orthotopic vs heterotopic. **Regardless of which diversion is chosen, postoperative patient satisfaction is improved by good preoperative patient education and participation in treatment decisions.**[44] Education and counseling must set appropriate expectations with regard to surgical decisions and comorbidities, previous surgical and radiation history, obesity, baseline renal function, sexual function and dexterity (for purposes of catheterization). These comorbidities should be weighed against the metabolic changes that can occur with specific bowel segments to help in choosing the best diversion for the patient.

Patients with bladder neck contracture or urethral strictures, especially after radiation, should undergo extensive counseling about surgical options.[45] As stated previously, if videourodynamics reveals an open bladder neck with urethral stricture (a combination many patients unfortunately have that involves outlet scar tissue in addition to severe incontinence), our group typically counsels patients that orthotopic diversion is not an option due to the devastated, non-functional bladder outlet. If the patient has a good capacity bladder with reasonable continence but a damaged outlet, he or she may be a candidate for a continent diversion such as appendicovesicostomy.[46]

A heterotopic continent diversion uses bowel to create a pouch and connects this reservoir to a cutaneous stoma with complete continence. **Optimal patients for a continent reservoir are those who independently care for themselves and have the dexterity to flush the stoma and perform self-catheterization every 4-6 hours.** There are reports of quadriplegic patients with enough manual dexterity to care for their pouch who have improved quality of life with a continent diversion.[47] **If considering a continent diversion, it is imperative to determine the patient's ability and understanding regarding a strict catheterization schedule because perforation can be lethal.** The acute

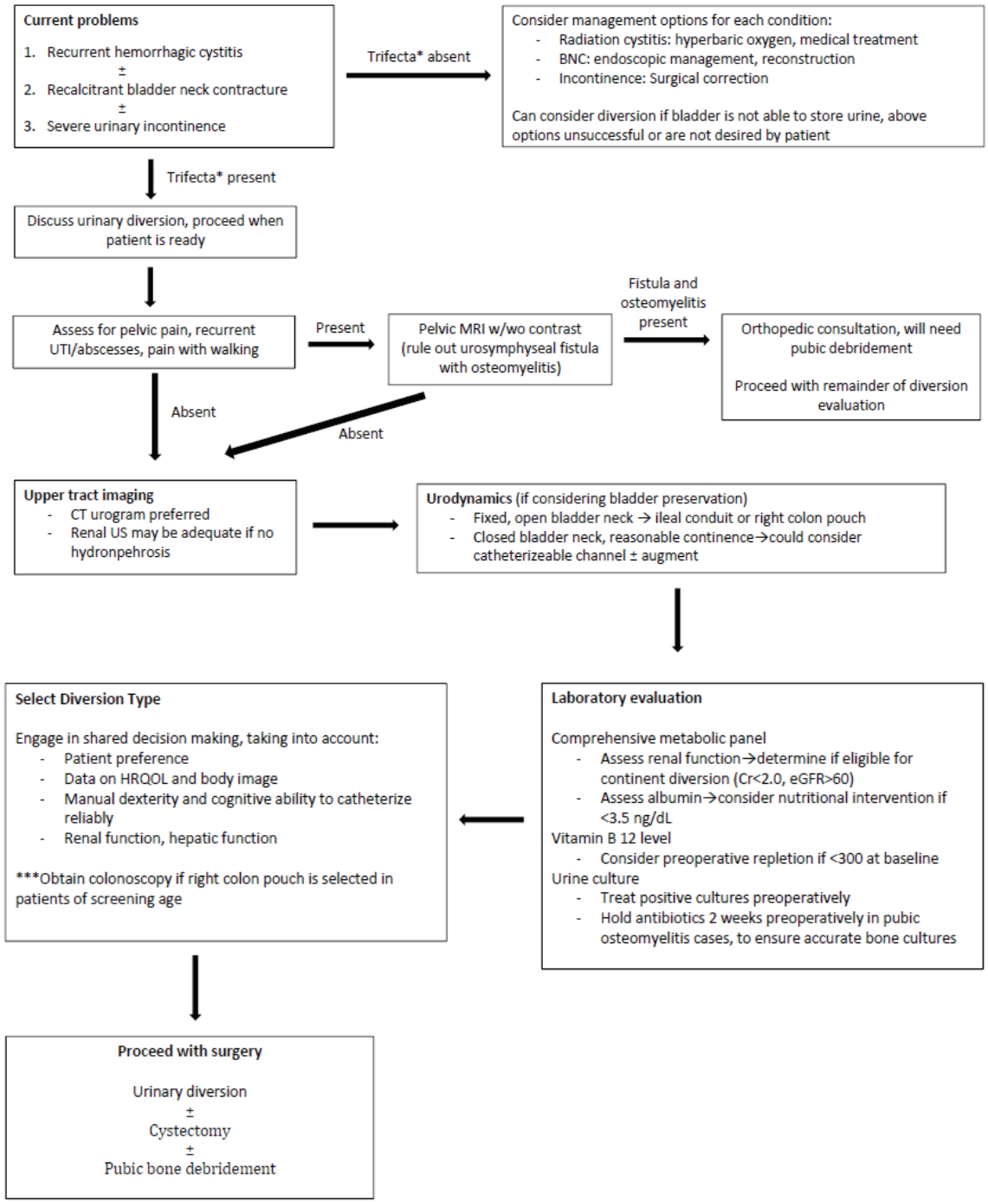

Figure 3. Algorithm for preoperative evaluation in patients with severe radiation injury to bladder. Trifecta refers to presence of all 3 conditions, which should lead to strong consideration of urinary diversion. *BNC*, bladder neck contracture. *Cr*, creatinine. *eGFR*, estimated glomerular filtration rate. *US*, ultrasound. *UTI*, urinary tract infection. *w/wo*, with or without.

inability to catheterize a continent cutaneous diversion is an urgent problem that most emergency room physicians are not trained to manage. It is important to consider this scenario in a patient who may live several hours away from an advanced hospital setting. Another consideration for the continent diversion is that urine resides longer in the reservoir compared to a non-continent diversion and can lead to chronic metabolic derangements.[48] The biggest predictor of metabolic derangements in patients with continent diversion is poor renal function, so these are generally not recommended for anyone with estimated glomerular filtration rate <40-60 ml/minute/1.73 m^2.

An orthotopic continent diversion, commonly called a neobladder, refers to the creation of a pouch from detubularized bowel to produce a reservoir between the upper tract and the native urethra. By relying on the native rhabdosphincter and pelvic floor for continence, a neobladder can restore daytime and nighttime continence while eliminating the need for catheterization.[49] As mentioned, this continent diversion is also at risk for chronic metabolic alterations due to the increased urinary dwell time since it is a true reservoir. **Orthotopic continent diversions are rarely used in the benign setting, typically because of preexisting radiation injury to the outlet.**

The most common urinary diversion used in this setting is the ileal conduit. It is an excellent option in patients with pelvic radiation and should be considered not only in those who are frail or do not want a continent diversion. Damage to the distal ileum is possible in patients with a history of pelvic radiation, and this segment should not be used if it appears thickened, white or fibrotic. An example of radiation induced scarring and adhesive disease is shown in figure 4.

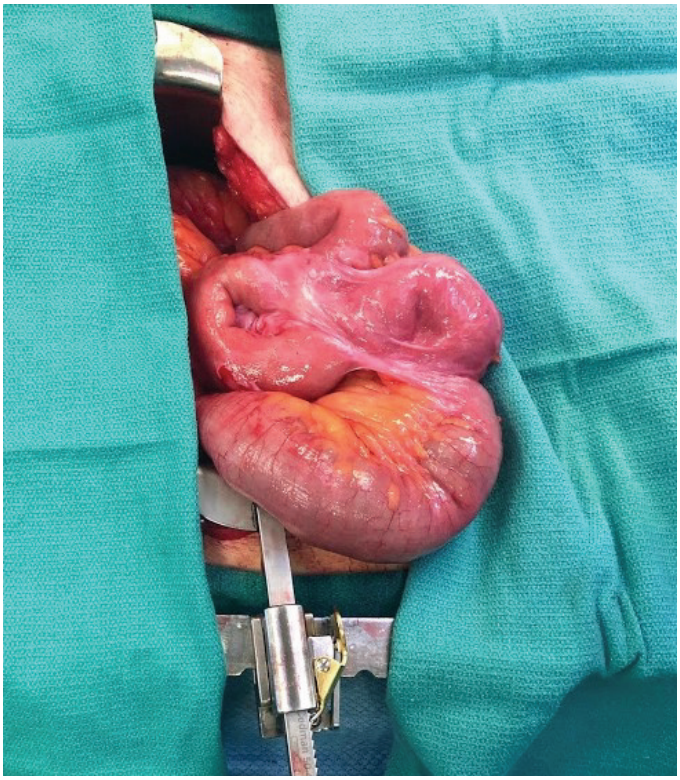

Figure 4. Radiation induced scarring and adhesions of small bowel.

Ileum is a popular choice for continent diversion due to its ability to distend and allow for higher capacity and lower pressures. A contraindication for using ileum is short gut syndrome. Patients with Crohn's disease could have an affected ileum, which can increase the risk of complications. In patients whose ileum is irradiated and cannot be used the transverse colon is another option for diversion.[50] Another situation in which colon may be used as diversion is in a patient who already has an end colostomy. By anastomosing the ureters to the previous colostomy, one can harvest a colostomy from proximal colon and avoid a bowel anastomosis.[51]

Jejunum and stomach have been used in the past for urinary diversion. However, jejunal conduits should never be used for diversions because they are associated with morbid hyponatremic metabolic acidosis.[52] However, stomach can cause hematuria-dysuria syndrome and confers an increased risk of gastric adenocarcinoma.[54]

ROLE OF CYSTECTOMY AT TIME OF BENIGN URINARY DIVERSION

Among patients undergoing urinary diversion for benign conditions the diversion component is the primary objective of surgery, and concurrent removal of the bladder is debated. Complications of leaving a defunctionalized bladder in situ can include pyocystis, malignancy and pain.[55] **The reported incidence of pyocystis ranges from 3.3%-67% in various series, and this condition can constitute a tremendous burden to the patient, with the potential for recurrent sepsis and the need for bladder washouts and intravenous antibiotics.** In a series of 24 patients treated with urinary diversion alone 8 (33%) subsequently had pyocystis and 6 (25%) eventually required simple cystectomy.[56]

Simple cystectomy does not add significant operative time or blood loss when performed in the benign setting, with 1 series indicating that simple cystectomy increases operative time by 27.5 minutes and blood loss by 46.7 ml.[57] The bladder can be safely bivalved from the bladder neck to the cul-de-sac posteriorly, with no posterior dissection needed near the vagina or rectum. The lateral "wings" of the bladder are then removed with the LigaSure™ device, and the mucosa of the bladder base is removed with cautery. This technique minimizes the risk of bleeding or injury to posterior structures and leaves a small remnant of detrusor muscle that can be closed to prevent leakage of peritoneal fluid per urethra. **Given the minimal risks and low added operative time of simple cystectomy at the time of urinary diversion, as well as the risks of leaving a defunctionalized bladder in situ, we believe that simple cystectomy should always be performed when feasible.**

OUTCOMES AND COMPLICATIONS

As mentioned, HRQOL outcome studies are limited in the benign population but improvements have been demonstrated in cancer survivors and in patients with neurogenic bladder undergoing cystectomy with urinary diversion. However, persistent urinary problems are possible even after diversion. In a series of 26 patients undergoing cystectomy with urinary diversion for benign indications 19 (73%) experienced resolution of preoperative urological condition at 90 days postoperatively, while 2 (8%) died within 90 days and 5 (19%) had persistent urological issues related to rectourethral fistula (2), recurrent urinary tract infections (2) and conduit-vaginal fistula (1).[58] Thus, although outcomes are generally good, patients should be counseled that urinary problems can persist following surgery.

There are well-known complications of this large operation that must be considered and discussed preoperatively. In a population based study the reported 30-day complication rate was 60.4% and 30-day mortality rate was 1.3%.[59] The most common complications were bleeding requiring transfusion (38.6% of patients), infection (31.1%) and sepsis (13.6%). Institutional series confirm these approximate complication rates, with reports of transfusion ranging from 4.0%-28%, infection from 35.0%-38.1% and mortality from 0.7%-7.6%.[19,58] The authors of a multi-institutional study of cancer survivors undergoing cystectomy and urinary diversion for radiation injury reported complications by Clavien grade, with grade 3 complications seen in 14% of patients, grade 4 in 15% and grade 5 (death) in 4%.[7] Extensive counseling regarding these risks and the relative benefits should be performed before proceeding with urinary diversion.

POSTOPERATIVE CONSIDERATIONS

ERAS protocols are popular following cystectomy for malignancy but have not been studied in the benign population. Most

of these patients have either neurogenic or radiated bowel, which in our experience does not allow for the early feeding elements of an ERAS protocol. Alvimopan may have a role in the benign cystectomy population since it has been studied following cystectomy for malignancy relative to placebo and reduces the time to bowel function, length of stay and incidence of ileus.[60] **A team approach during the recovery period is essential, with assistance from experienced inpatient nurses, wound ostomy nursing and physical therapy.**

Postoperative drainage is important to minimize the risk of urine leak. For ileal conduits bilateral ureteral stents are used and 2 drains are placed in the abdomen, ie 1 in the pelvis and 1 near the ureterointestinal anastomosis. For right colon pouch the same stents and drains are used, as well as a 12Fr Foley catheter in the catheterizable channel and a 20Fr suprapubic tube. Ureteral stents do not appear to impact the stricture or urine leak rate, although the optimal duration of stent placement has not been determined.[61] We remove ureteral stents at the first postoperative visit, typically 2-3 weeks after surgery. The abdominal drains remain in place until the patient resumes a regular diet, at which point the drains are removed if outputs are not concerning for urine or bowel leak.

Patients are followed closely after stent removal to ensure appropriate upper tract function. **We obtain a renal ultrasound and BMP at 4 weeks after stent removal, then at 3 months and then annually**. Vitamin B12 level is also assessed yearly to monitor for deficiency.[62]

CONCLUSIONS

The common indications for cystectomy and urinary diversion in benign settings include radiation injury to the bladder and bladder outlet, neurogenic bladder, IC/BPS and refractory incontinence. Careful patient selection is critical before performing this elective procedure, and modifiable risk factors should be optimized preoperatively. Urinary diversion type should be selected through shared decision making with discussion of the relative metabolic risks and postoperative care requirements. While this intervention can dramatically improve quality of life, the major surgical risks must also be discussed. Long-term follow-up to monitor renal function, B12 level and upper urinary tracts is essential.

DID YOU KNOW?

- Urinary diversion can dramatically improve quality of life when performed for benign indications. Patient selection is crucial, with consideration of nutritional status, obesity, mobility, deconditioning and prior radiation.
- Quality of life and body image are equivalent between continent and non-continent diversions, making both excellent choices for the appropriately selected patient.
- Preoperative radiographic assessment with cross-sectional imaging (CT urography is preferred) is essential to define the abdominal and pelvic anatomy and guide surgical management.
- Concurrent simple cystectomy at the time of urinary diversion adds minimal morbidity and is recommended to avoid complications of the defunctionalized bladder.
- Cystectomy and urinary diversion in the benign setting can improve quality of life but the complication rate is noteworthy and must be discussed during preoperative counseling.

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Study Questions Volume 39 Lesson 25

1. Cystectomy and urinary diversion in patients with radiation induced injuries leads to
   a. no change in HRQOL
   b. diminished HRQOL related to body image and need for stoma
   c. diminished HRQOL due to the high complication rate of post-radiation cystectomy
   d. improved HRQOL related to pain, general health, emotional well-being and social functioning

2. A 68-year-old man had a bladder neck contracture following radical prostatectomy and salvage radiation. He had incontinence after 2 incisions of the bladder neck contracture and was treated with an artificial urinary sphincter. He now has severe pelvic pain and an elevated erythrocyte sedimentation rate and is suspected of having osteomyelitis. The next step is
   a. CT urogram
   b. MRI with gadolinium
   c. 6 weeks of intravenous antibiotics
   d. removal of the artificial urinary sphincter

3. When counseling patients on selecting a type of urinary diversion, the factor most likely to improve patient satisfaction is
   a. age
   b. gender
   c. shared decision making
   d. selecting a continent diversion

4. A 69-year-old man has recurrent gross hematuria secondary to radiation cystitis 5 years following external beam radiation therapy for prostate cancer. He also has a refractory bladder neck contracture. He has some rectal urgency but has had no hematochezia since he had a bleeding area in the rectum fulgurated 2 years ago. A recent CT reveals no hydroureteronephrosis. He requests a urinary diversion. The next step is
   a. ileal conduit alone
   b. simple cystectomy and ileal conduit
   c. ileocystoplasty and catheterizable stoma
   d. total pelvic exenteration, colostomy and an ileal conduit

5. Long-term follow-up after urinary diversion for benign indications should include
   a. annual BMP
   b. annual BMP, B12 level and renal ultrasound
   c. annual BMP, B12 level, renal ultrasound and loopogram
   d. annual BMP, B12 level, renal ultrasound, loopogram and mercaptoacetyltriglycine renal scan

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