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LESSON 27

## Partial Cystectomy: Indications, Techniques, and Outcomes

**Learning Objective:** At the conclusion of this continuing medical education activity, the participant will be able to review the indications and surgical techniques with different approaches to partial cystectomy, and evaluate the oncologic outcomes of surgical bladder preservation with partial cystectomy.

This AUA Update aligns with the American Board of Urology Module on Oncology, Urinary Diversion and Adrenal. Additional information on this topic can be found in the AUA Core Curriculum sections on Laparoscopy and Robotic Surgery, and Oncology-Bladder.



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**KEY WORDS:** bladder preservation, bladder cancer, partial cystectomy

## INTRODUCTION

Partial cystectomy (PC) is a viable option for solitary tumors located in the bladder diverticula or on the dome or upper posterior wall of the bladder that are not amenable to complete endoscopic resection. In addition, PC can be offered to a select group of patients with muscle-invasive bladder cancer (MIBC) with significant comorbidities or those who desire to preserve their bladder with surgical therapy.<sup>1</sup> Other indications include urachal adenocarcinoma and selected benign tumors not amenable to transurethral resection (TUR).

Historically, low 5-year overall survival (OS; 24%) and high rates of local recurrence, along with the risk of spillage and wound seeding, have led to less PC utilization for the treatment of MIBC.<sup>2</sup> However, with more strict selection criteria, it has been associated with acceptable oncologic results.

## INDICATIONS

**Ideally, PC can be offered to patients with a solitary tumor amenable to resection with a wide margin (2 cm), with or without the need for ureteral reimplantation.** Additional indications include solitary benign tumors and difficult-to-resect or unresectable nonmuscle-invasive bladder cancer (NMIBC). Furthermore, candidates should have good functional bladder capacity, preoperative urinary symptom evaluation, and reasonable expectation of adequate bladder capacity postoperatively. **The indications and contraindications are summarized in Table 1.**

**Table 1.** Indications and Selection Criteria for Partial Cystectomy

Indications	Contraindications
UC <ul style="list-style-type: none"><li>• Solitary tumor</li><li>• cT2</li><li>• Amenable to 2-cm margin resection</li><li>• Normal functional bladder capacity</li></ul>	Presence of CIS Tumor involving bladder neck or trigone Poor functional bladder capacity Need for ureteral reimplantation (relative) <sup>2</sup>
Bladder diverticulum UC	
Benign tumors <ul style="list-style-type: none"><li>• Leiomyoma</li><li>• Paraganglioma</li><li>• Endometriosis</li><li>• Urachal anomalies</li><li>• Colovesicular or vesicovaginal fistulas</li></ul>	

Abbreviations: CIS, carcinoma in situ; UC, urothelial carcinoma.

For patients with MIBC who are medically unable to undergo surgery or are seeking an alternative to radical cystectomy, bladder-preserving therapy with chemoradiation, trimodality therapy (TMT), is an acceptable alternative for cystectomy.<sup>3</sup> The bladder preservation with TMT provides favorable outcomes and a manageable toxicity profile for patients 65 years of age and above, with a 2-year OS of 94.4% and a 2-year disease-free survival of 72.6%, according to prospective phase II data.<sup>4</sup>

In addition to TMT, PC has emerged as a treatment alternative for patients who desire bladder preservation or are medically unfit for radical cystectomy. One potential benefit of PC over TMT is obtaining a complete resection confirmed on pathological analysis. TMT, in contrast, is associated with a lack of complete pathological information and potential understaging. Based on cystoscopic evaluation following TMT, patients with apparent complete clinical response (cT0) may harbor residual bladder cancer in 52% of cases and muscle-invasive disease in 25.8% of cases.<sup>5</sup>

Compared to TUR, PC offers full-thickness tissue resection, including the perivesical fat, and enables a more accurate assessment of the surgical margins. Additionally, it is usually combined with pelvic lymphadenectomy, allowing more accurate staging.

## TECHNIQUE

As with any patient with newly diagnosed bladder cancer, the patient should undergo a staging evaluation. This includes cross-sectional imaging of the abdomen and pelvis with delayed phases to evaluate the upper tracts and chest imaging. Specifically, candidates require cystoscopic evaluation to assess the tumor further and perform random bladder biopsies to rule out the presence of carcinoma in situ (CIS) or multifocal disease. In addition, preoperative evaluation of lower urinary tract symptoms (LUTS) and bladder capacity is essential to ensure adequate bladder function and avoid severe LUTS postoperatively. This evaluation includes, but is not limited to, International Prostate Symptom Score, bladder diary, uroflowmetry, and bladder volume measurement as necessary. The patients should be counseled regarding the possibility of not achieving adequate margins and the potential need to convert to radical cystectomy with urinary diversion if feasible. Open PC is a very common approach and widely utilized for the aforementioned indications. In addition, laparoscopic (including robotic-assisted) approaches have gained popularity, given the relatively low morbidity associated with minimally invasive surgical techniques.<sup>6-8</sup> In this section, we will describe the major steps of PC in both open and robotic approaches.

**Open PC.** The patient is positioned supine with mild flexion at the level of the symphysis pubis.<sup>9</sup> A Foley catheter should be placed and accessible in the operative field. An extraperitoneal approach is preferred for lesions involving the dome or anterior bladder wall, whereas a transperitoneal approach is preferred when the tumor involves the posterior wall of the bladder. A

**ABBREVIATIONS:** carcinoma in situ (CIS), disease-specific survival (DSS), lower urinary tract symptoms (LUTS), muscle-invasive bladder cancer (MIBC), nonmuscle-invasive bladder cancer (NMIBC), overall survival (OS), partial cystectomy (PC), trimodality therapy (TMT), transurethral resection (TUR)

lower midline incision is made from the symphysis pubis to the level of the umbilicus. Dissection is carried out through the linea alba, and the preperitoneal space of Retzius is entered. Blunt dissection is carried out to mobilize the bladder and separate it from the pelvic side walls and anterior abdominal wall. Self-retaining retractors are placed.

To achieve adequate exposure, the peritoneum can be incised lateral to the lateral umbilical fold and mobilized posteriorly. In addition, the lateral vascular bladder pedicle can be ligated unilaterally to enhance the exposure of the posterior and lateral bladder walls. Pelvic lymphadenectomy should be performed in a similar fashion as in radical cystectomy. After adequate mobilization and exposure of the bladder, en bloc tumor resection is performed. This is carried out with the aid of endoscopic evaluation to confirm the tumor location and identify the ureter orifices. Entry to the bladder distant from the tumor is preferable. The tumor should be resected en bloc with the surrounding perivesical fat, peritoneum, and 1-2-cm margin. The specimen is sent for a frozen section for immediate assessment of the tumor stage and margins. Subsequently, the bladder defect is closed in a 2-layer running fashion using a 3-0 polyglactin suture for mucosal apposition and a 2-0 polyglactin suture for the outer layer. The bladder is filled with normal saline to ensure watertight closure, and a closed suction drain is placed in the bladder's vicinity. The abdominal wall fascia and the skin incision are closed in the standard fashion.

**In cases of urachal adenocarcinoma, the urachus and the umbilicus should be preserved in continuity and resected en bloc with a bladder margin at the dome.**

**Robotic PC.** The patient is positioned in either a low lithotomy position or supine position (da Vinci Xi model), and a Foley catheter is placed and accessible in the sterile field. After achieving pneumoperitoneum, an 8-mm robotic trocar is placed 2 cm above the umbilicus. Two 8-mm trocars are placed on either side of the midline at the level of the umbilicus. An

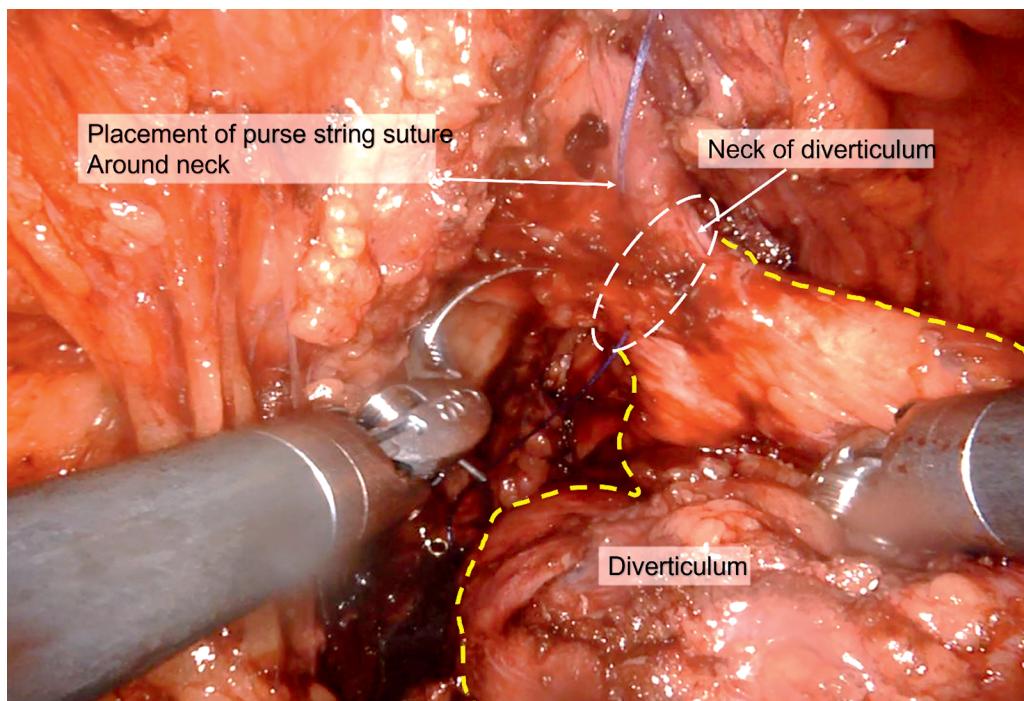
extra 8-mm robotic trocar is placed laterally on one side, and a 12-mm assistant trocar is placed on the contralateral side. Afterward, the robot is docked on either side of the patient (Xi model) or between the legs (Si model).

In cases of posterior wall tumors, the bladder is left attached anteriorly, providing better exposure during posterior wall resection. However, in anterior wall tumors the peritoneum is incised lateral to the obliterated umbilical ligament. The bladder is mobilized on both sides before dividing the urachus with subsequent entry to the space of Retzius. The dissection can be achieved using robotic monopolar scissors and robotic bipolar grasper, with the combination of both sharp and blunt dissection.

After adequate exposure, a flexible cystoscope may facilitate tumor localization. En bloc resection of the tumor with a 2-cm margin is performed using monopolar scissors or Vessel Sealer. During resection, meticulous suction should be performed to eliminate spillage of urine into the peritoneal cavity, and a Foley catheter should continuously drain the bladder. The specimen is immediately placed in a specimen bag, and the bladder defect is closed using 2 layers with 3-0 absorbable barbed sutures. At this point, pelvic lymphadenectomy is performed in the usual fashion as in radical cystectomy.

Like open surgery, in cases of urachal carcinoma, the urachus is left in continuity with the umbilicus and resected with the bladder dome margin and the umbilicus if indicated. Moreover, a flexible cystoscope can assist with the detection of diverticular tumor, which is approached similarly during PC. In order to minimize the risk of tumor spillage, meticulous dissection is carried out; a purse-string suture can be applied to the neck of the diverticulum, followed by en bloc resection of the diverticulum including the tumor (see Figure).

An indwelling 20F Foley catheter is then placed, and the bladder is instilled with normal saline to confirm a watertight closure. A closed suction drain is placed in the pelvis. The



**Figure.** A purse-string suture is applied to the diverticulum neck to decrease the risk of spillage during partial cystectomy.

specimen is then removed via the 12-mm assistant port, and the fascia is subsequently closed in the usual fashion.

## POSTOPERATIVE CARE AND COMPLICATIONS

The patient can be started on a clear liquid diet on postoperative day 1, and the diet can be advanced as tolerated. Incentive spirometry and early ambulation are encouraged. The drain can be removed after 24 hours, provided the output is not increased, and the patient can be discharged according to the usual pathway. The surgeon should suspect a urinary leak if there is increased output from the drain. This can be confirmed by obtaining a cystogram and creatinine levels from the drain output.

An outpatient cystogram may be performed on postoperative days 7-10 if there is a concern for urine leak, and the Foley can be subsequently removed. Antibiotics are recommended for cystography and Foley catheter removal, as AUA's best practice statement recommends.<sup>10</sup>

Although rare, the surgeon should be aware of potential associated complications as with any bladder surgery, including infections, bleeding, bowel injury, and urine leak.

## OUTCOMES

Although no randomized controlled trials were published comparing PC to radical cystectomy, multiple recent retrospective cohorts showed acceptable oncologic outcomes. These cohorts are summarized in Table 2.

A retrospective evaluation from Memorial Sloan Kettering was conducted on 58 patients who underwent PC from 1995-2001, with a mean follow-up of 33.4 months.<sup>11</sup> Twelve percent of patients had nonmuscle-invasive bladder recurrence, and 38% had advanced recurrence (locally invasive disease or metastasis). On multivariate analysis, the presence of CIS (OR 7.0,  $P = .004$ ) and lymph node metastasis (OR 4.3,  $P = .031$ ) were significant predictors of advanced recurrence. Five-year OS was 68%.

Data from a cohort of 37 PC patients at MD Anderson with a mean follow-up of 72 months showed a 5-year OS and disease-specific survival (DSS) of 67% and 87%, respectively.<sup>2</sup> They excluded patients with concomitant CIS and those who needed ureteral reimplantation due to tumor involvement. Notably, there were no incidences of wound recurrences, which was attributed to improved surgical technique and more

selective eligibility criteria. On multivariate analysis, adjuvant chemotherapy was also observed to be significantly associated with prolonged advanced recurrence-free survival (HR 0.18, CI 0.04-0.79,  $P = .03$ ). However, there were reported cases of late advanced recurrence as far as 138 months following PC, underscoring the importance of strict long-term cystoscopic surveillance. Furthermore, Smaldone et al published a series of 25 patients who underwent PC for solitary T2 or high-grade T1 bladder cancer.<sup>12</sup> All the patients received preoperative radiotherapy, single-dose intravesical chemotherapy at the time of surgery, and postoperative intravesical bacillus Calmette-Guérin therapy. At a mean follow-up of 45.3 months, 5-year OS was 74%, and 5-year DSS was 84%. Interestingly, nonmuscle-invasive recurrence was only 8% compared to the Memorial Sloan Kettering Cancer Center cohort (12%) and MD Anderson cohort (24%), which was attributed to postoperative induction bacillus Calmette-Guérin therapy.

Notably, the majority of the patients in the Memorial Sloan Kettering Cancer Center and MD Anderson groups underwent pelvic lymphadenectomy. However, in the cohort from Smaldone et al, it was selectively performed in those who had aggressive pathological characteristics in TUR specimen (high-grade tumors, angiolymphatic invasion, and variant histology), palpable nodal disease during surgery, or bulky lymphadenopathy on preoperative CT.<sup>12</sup>

More recently, Kijima et al published their single-institution prospective cohort of 154 patients who underwent PC for MIBC.<sup>13</sup> Patients underwent maximal TUR and induction chemoradiation. Only those who showed complete remission were offered PC with pelvic lymphadenectomy. Despite neoadjuvant chemoradiation, 10% of patients had residual invasive cancer at the time of PC. At a median of 48 months, 5-year OS and DSS were 91% and 93%, respectively. Moreover, the quality-of-life results were satisfactory following PC. Small bladder capacity (maximum voided volume <200 mL) occurred in 3% of the patients, and the median International Prostate Symptom Score following PC was 2.

## SURVEILLANCE/MONITORING

There are insufficient data to establish generalized surveillance protocols for patients who underwent PC. Based on the published cohorts, such patients should be closely monitored with cystoscopic evaluation and upper tract imaging, as late

**Table 2.** Summary of Reviewed Partial Cystectomy Cohorts

Cohort	Sample size	Mean follow-up	Survival outcomes	Recurrence
Holzbeierlein et al (2004) <sup>11</sup>	N=58	33.4 mo	5-year OS = 69%	NMI recurrence = 12% Advanced recurrence = 38%
Kassouf et al (2006) <sup>2</sup>	N=37	72.6 mo	5-year OS = 67% 5-year DSS = 87%	NMI recurrence = 24% Advanced recurrence = 24%
Smaldone et al (2008) <sup>12</sup>	N=25	45.3 mo	5-year OS = 74% 5-year DSS = 84%	NMI recurrence = 8% Advanced recurrence = 20%
Kijima et al (2019) <sup>13</sup>	N=107	48 mo (median)	5-year OS = 91% 5-year DSS = 93%	NMI recurrence = 18% Advanced recurrence = 4% (MIBC recurrence only)

Abbreviations: DSS, disease-specific survival; MIBC, muscle-invasive bladder cancer; NMI, nonmuscle-invasive; OS, overall survival.

recurrences have been observed. In our practice, for patients who underwent PC for MIBC, we perform cystoscopy every 3 months for 2 years, followed by every 6 months for 2 years, and then 6-12 months in subsequent years. In cases of locally advanced recurrences, salvage radical cystectomy can be curative if feasible to perform; alternatively, chemoradiation may be utilized. In addition, patients should be monitored for LUTS, eg, frequency and urgency, which can result from decreased bladder capacity.

## CONCLUSIONS

There is strong interest in bladder-sparing approaches for MIBC and high-risk NMIBC, in addition to adenocarcinoma and benign bladder tumors, particularly those anterior to the bladder. PC is an excellent form of surgical bladder preservation in well-selected candidates that can be safely performed via both open and robotic approaches, with the latter gaining more momentum due to the advantages of minimally invasive surgery. Oncologic outcomes are acceptable for PC when adhering to strict inclusion criteria and incorporating a multimodal (intravesical therapy, pre- and postoperative radiotherapy) approach if warranted. While the rate of tumor spillage and seeding remains very low, patients should be informed of this specific risk and caution should be exercised intraoperatively. Preservation of the urinary and sexual function makes this treatment option attractive to a significant subset

of patients. Urologists should strongly consider offering PC to those well-suited for this approach.

### DID YOU KNOW?

- Bladder-preserving therapy with chemoradiation, TMT, is an appropriate alternative to cystectomy for patients with MIBC who are medically unable to undergo surgery or are seeking an alternative to radical cystectomy.
- In addition to NMIBC and benign bladder tumors that are not amenable to TUR, patients with solitary cT2 MIBC may be eligible for PC.
- PC allows full-thickness tissue removal and permits a more precise assessment of the surgical margins than TUR. It is typically done with pelvic lymphadenectomy to improve staging accuracy.
- The urachus and umbilicus should be preserved in continuity and resected en bloc with a bladder margin in cases of urachal adenocarcinoma.
- Multiple cohorts have demonstrated good survival rates for individuals undergoing PC for MIBC, with OS ranging from 67% to 91%.

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# Study Questions Volume 42 Lesson 27

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1. Which one of the following is a contraindication to performing partial cystectomy for muscle-invasive bladder cancer?
  - a. Presence of concomitant CIS
  - b. 2-cm solitary tumor involving the dome
  - c. Urachal adenocarcinoma
  - d. 5-cm leiomyoma not amenable to transurethral resection
2. A 70-year-old male undergoes partial cystectomy for a 3-cm tumor involving the dome of the bladder. On post-operative day 2, the surgeon notices increased output from the closed suction drain. The best next step is
  - a. Remove the drain suction
  - b. Urine culture
  - c. Creatinine level from the drain
  - d. Urgent cystotomy repair
3. Which of the following is the best option for localized urachal adenocarcinoma?
  - a. Resection of the urachus
  - b. Radiation therapy
  - c. Chemotherapy
  - d. Partial cystectomy with resection of the urachus and bladder dome margin
4. Which of the following patient scenarios is most suited for partial cystectomy?
  - a. A 70-year-old with T4 urothelial carcinoma involving the right ureteral orifice
  - b. A 63-year-old with muscle-invasive urothelial carcinoma involving the bladder neck
  - c. A 55-year-old with 5-cm sessile tumor involving a large bladder diverticulum
  - d. An 88-year-old with prior radiation for prostate cancer, severe LUTS, and 3-cm tumor involving the bladder dome
5. A 75-year-old male patient presents with a solitary tumor involving the bladder dome. After transurethral resection, pathology showed muscle-invasive urothelial carcinoma. The patient would like to avoid surgery due to significant comorbidities. Workup revealed no distant metastasis. The best next step is
  - a. Palliative chemotherapy
  - b. Radiation therapy
  - c. Trimodality therapy
  - d. Hospice