




Robotic-assisted radical cystectomy: the first multicentric Brazilian experience

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Abstract

The objective of this study is to report the first multicentric Brazilian series and learning curve of robotic radical cystectomy (RARC) with related intra- and postoperative outcomes. We retrospectively analyzed 37 RARC prospectively collected at four different centers in Brazil, from 2013 to 2019. We analyzed the patient's demographics, pathological tumor, and nodal status, as well as intra- and postoperative outcomes. Statistical analysis was performed with the IBM (SPSS version 25) software. Overall, 86% were male, and the median age was 69 years. 83% had muscle-invasive bladder cancer, and 17% a high-grade, recurrent non-muscle-invasive tumor. The median operative time was 420 min with 300 min as console time. Median blood loss was 350 ml and transfusion rate was 10%. In 68% of the cases, we performed an intracorporeal Bricker urinary diversion, 24% intracorporeal neobladder, and 8% ureterostomy. Six patients (16%) had a Clavien 1–2, 8% had Clavien 3, 2.5% had a Clavien 4, and 5% had Clavien 5. The median length of hospital stay was 7 days. The final pathological exam pointed out pT0 in 16%, pT1 in 8%, pT2 in 32%, \geq pT3 in 27%, and 16% pTis. 95% had negative surgical margins. The survival at 30, 90, and 180 days was 98%, 95%, and 95%, respectively. To our knowledge, this is the first multicentric series of RARC reporting the learning curve in Brazil; even if still representing a challenging procedure, RARC could be safely and effectively faced by experienced surgeons at centers with high volumes of robotic surgery.

Keywords Robotic surgery · Robotic-assisted radical cystectomy · Bladder cancer

Introduction

Radical cystectomy (RC) represents the standard of care for very-high-risk non-muscle-invasive BCa and non-metastatic, muscle-invasive BCa [1].

Indeed, RC is one of the most challenging surgical procedures, based on a demolition phase, an extended nodal dissection, and, finally, a reconstructive step to restore the urinary tract. Given such complexity and despite consolidated surgical techniques, radical cystectomy is still characterized by a high rate of complications and 30-day mortality, reaching 10% for all age groups [23].

The advantages of robotic surgery—named the magnification, the 3D visualization, the precision of dissection, and that of suturing—seem to address the complexity of RC. Initial robotic experience from retrospective and prospective trials pointed out an apparent improvement of intra- and perioperative outcomes provided by the robotic approach (less blood loss and length of hospital stay) [2]. However, the apparent steep learning curve of robotic-assisted radical cystectomy (RARC) is one of the factors limiting its widespread diffusion, with the open approach still being the most used also in centers with a robotic setup.

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Consistent with the global trend, robotic platforms increased in Brazil as well, with robotic radical prostatectomy implemented in many centers from skilled robotic surgeons. The present article aims to report the first series of RARC performed throughout Brazil in high-volume robotic centers, trying to depict the possible transition to robotic surgery also in the field of bladder cancer.

Materials and methods

Study design

We performed a prospective analysis of the first prospectively collected 37 patients undergoing RARC in Brazil from 2013 to 2019. The cases were collected among four different centers (Hospital 9 de Julho, Hospital Sírio Libanês, Hospital BP Mirante, and Hospital Alemão Oswaldo Cruz) in São Paulo (BZ). All patients underwent clinical and image exam evaluation (CT or MRI) to stage the disease and rule out any metastasis or conditions that contraindicate the surgical procedure.

The criteria to select the cohort to be operated by robotic surgery were the availability of this technology in centers that had patients with an indication of radical cystectomy for bladder cancer. Moreover, a total of six different surgeons performed the procedures described in this article; three of them performed surgeries in more than one center aforementioned. Also, before their first RARC case, all surgeons already had expertise in open cystectomies and robotic-assisted radical prostatectomies.

A significant percentage of those interventions were performed in 2018–2019 (15 procedures); therefore, the present analysis addresses intra- and postoperative course, oncologic surgical outcome (surgical margin status and nodal yield), complications, and readmission rate.

The following variables were prospectively collected for each patient and inserted in a dedicated database:

- Preoperative parameters: patient's age, sex, type of cancer on bladder biopsy, previous BCG, and neoadjuvant chemotherapy treatment. The time between the biopsy and the cystectomy was assessed as well and reported in days.
- Perioperative parameters: type of urinary diversion, median operative time in minutes, median console time in minutes, and median blood loss (ml).
- Complications: reported according to Clavien–Dindo classification. We also described the rate of blood transfusion, reoperation rate, and overall survival at 30, 90, and 180 days.
- Postoperative parameters: final pathological analysis, surgical margin status, the median number of nodes retrieved, rate of patient with nodal involvement, con-

comitant prostate cancer, Intensive Care Unit (ICU) admission, length of hospital stay, and readmission rate.

Statistics

We reported the continuous variables as median and interquartile ranges (IQR), while the categorical variables were reported as proportions and frequencies. All statistical analysis was performed on IBM-SPSS software version 25.

Patient positioning

The patient is positioned in a lithotomy position with the extremities and articulations protected by pads. Also, to secure the patient during the Trendelenburg angulation, a secure strap is placed around the chest.

Trocar placement and docking

The trocar configuration describes six-transperitoneal ports (four robotic and two for the assistant). Also, the assistant uses the 12 mm trocar, placed on the left side, during the bowel stapling. The first trocar is placed after performing the pneumoperitoneum with the Veress needle.

After the port placement, the robot is positioned and docked in the middle of the legs, the patient is angled to 28° Trendelenburg position, and the surgery begins with 10–15 mmHg pneumoperitoneum.

Surgical technique

1. The instrument insertion is performed under visualization. We usually perform the whole procedure with Fenestrated bipolar, Scissors, and Prograsp forceps. For the suture steps, we use two needle drivers.
2. We start the procedure with the bilateral incision at the pelvic brim to open the posterior parietal peritoneum and mobilize the ureters distally until the ureterovesical junction. Afterward, we dissect and divide the ureters between two Hem-o-lock clips (one distal and one proximal) at the ureterovesical junction. The distal ureter stump is usually sent to frozen section analysis to rule out any possible positive margin.
3. Afterward, the rectovesical space is accessed with a transverse incision and dissected until the pre-rectal fat plane to separate the rectum from the posterior bladder wall.
4. In male patients, we ligate the bladder and prostate vascular pedicles with Hem-o-Lock clips until the endopelvic fascia. We also resect the seminal vesicles during prostate removal. Female patients underwent the same step for bladder dissection. However, in this group, we perform the salpingo-oophorectomy and anterior vaginal wall resection.

5. Following the vascular control, the peritoneum is opened, the umbilical ligaments are resected, and the bladder is dropped. In sequence, the endopelvic fascia is incised on both sides.
6. Afterward, the dorsal venous complex is divided, the urethra is dissected and transected between two Hem-o-locks (one distal and one proximal) to minimize tumor spread inside the abdominal cavity. The radical cystectomy specimen is bagged immediately after the urethral incision.
7. The local hemostatic control is performed by applying a running suture in the dorsal venous complex divided during the bladder removal.
8. In sequence, an extended pelvic lymphadenectomy is performed. The bilateral lymph-node dissection in all cases extends from the obturator fossa and iliac bifurcation until level 2 anatomic region. The lymphadenectomy specimen is placed in a specimen retrieval bag.
9. The urinary diversion that we mostly reported in the current study is the intracorporeal ileal conduit (Bricker), made of 15–20 cm of ileal bowel. Bowel anastomosis is then performed with a stapler placed through the left lower quadrant trocar.
10. The left ureter is placed under the sigmoid colon to reach the right ureter for the Bricker anastomosis. We implant the ureters individually in the ureteroileal anastomosis using monocryl 3.0, after placing a double J stent on each ureter.
11. Finally, the distal part of the conduit is displaced towards the previously marked site on the abdominal skin to build the stoma lateral to the umbilicus on the right side. The specimen is retrieved through a midline incision extending the previous incision performed to place the central trocar.

The surgical approach for patients who underwent neobladder reconstruction (9 patients) follows the same technique as described by Wiklund et al. [3].

Postoperative care

The postoperative period after radical cystectomies follows the ERAS protocol in terms of nasogastric tube management, analgesia, mobilization, nutrition, and abdominal drain care [4].

Results

Preoperative results (Table 1)

Eighty-six percent of the patients in this study were male, and the median age was 69 years (IQR = 11). Overall,

Table 1 Patient demographics

Preoperative data	<i>n</i>	(%)
Patients	37	
Median age (year), (IQR)	69 (11)	
Sex		
Male	32	86
Female	5	14
Type of bladder cancer on biopsy		
Muscle invasive	31	83
Recurrent high grade	6	17
Previous BCG	6	17
Neoadjuvant QT	11	29
Median time between the biopsy and RARC, days (IQR)	55 (95.5)	

IQR interquartile range, *BCG* bacillus calmette-guérin, *QT* chemotherapy, *RARC* robotic-assisted radical cystectomy

83% underwent radical cystectomy for muscular invasive bladder cancer, while the 17% remaining had recurrent high-grade non-muscle-invasive disease. Eleven patients (30%) received neoadjuvant chemotherapy and six (16%) intravesical BCG treatments before the surgical procedure. The median time between the bladder biopsy/resection and radical cystectomy was 55 days (IQR = 95.5).

Perioperative results and complications (Table 2)

We used the Da Vinci Si in 95% of the cases (35 patients) and the Xi in the two remaining surgeries. The median operative time was 420 min (IQR = 190), median console time was 300 min (IQR = 170), and median blood loss was 350 ml (IQR = 262.5). The preferred urinary diversion was the intracorporeal Bricker technique in 25 cases, although we performed nine neobladders and three ureterostomies.

Four patients (10%) required a blood transfusion during surgery. In the postoperative course, 12 patients (32%) had complications: six had a Clavien 1 or 2 (16%), three had a Clavien 3 (8%), one patient had a Clavien 4, and two had Clavien 5, while in the ICU (one patient died from pneumonia in the seventh postoperative day, while the other patient died from pulmonary thromboembolism 38 days after the surgery).

Pathology report and postoperative outcomes (Table 3)

Ninety-five percent of patients had negative soft-tissue margins. Lymph-node dissection was extended until anatomical level 2, and the median number of nodes resected was 25 (IQR = 19.75). Eight patients (20%) had nodal involvement.

Table 2 Intraoperative parameters

Perioperative data	<i>n</i>	(%)
Type of robot		
Si	35	95
Xi	2	5
Urinary diversion		
Bricker	25	68
Neobladder	9	24
Ureterostomy	3	8
Operative complication(Clavien-Dindo)		
Clavien 1–2	6	16
Clavien 3	3	8
Clavien 4	1	2.50
Clavien 5	2	5
Blood transfusion	4	10
Median operative time, min (IQR)	420 (190)	
Median console time, min (IQR)	300 (170)	
Median blood loss, ml (IQR)	350 (262.5)	

Table 3 Pathology report

Postoperative data	<i>n</i>	(%)
pT stage		
pT0	6	16
pT1	3	8
pTis	6	16
pT2a–b	12	32
≥ cT3a	10	27
pN stage		
pNx	2	5
pN0	27	65
pN+	8	20
Free margins	35	95
Median lymph nodes taken, (IQR)	25 (19.75)	
Patients with metastatic nodes	8	21
ICU admission	9	24
Concomitant prostate Ca	7	19
Median hospital stay, (IQR)	7 (3)	
Readmission in 90 days	15	38
Reintervention in 90 days	3	8
Survival in 30 days	36	98
Survival in 90 days	35	95
Survival in 180 days	35	95

pT pathologic T, *IQR* interquartile range, *ICU* intensive care unit

Overall, seven patients (19%) were diagnosed with prostate adenocarcinoma concomitant to bladder cancer.

The overall ICU admission rate was 25% within 30 days of surgery. Half of these patients only stayed overnight for

the immediate postoperative period and were discharged to the surgical ward in the next morning to continue the postoperative care.

Overall, we had three patients who underwent reintervention in the follow-up period. The first patient had a Bricker obstruction on the fourth postoperative day and underwent open surgery. The second patient also underwent an open surgery due to ureteroileal anastomosis fistula diagnosed on CT scan. Finally, the third patient underwent a cystoscopy and clot evacuation on the 34th postoperative day due to hematuria and neobladder obstruction by clots. All three patients described had a satisfactory postoperative recovery with no intraoperative or postoperative complications.

The median hospital stay was 7 days, and the hospital readmission rate at day 90 was 38% (15 patients). The overall survival rate at 30, 90, and 180 days after cystectomy was 98%, 95%, and 95%, respectively.

Discussion

Since its approval in 2000, robotic surgery has been increasingly adopted for many surgical procedures, with radical prostatectomy being the most frequent robotic indication. The introduction of RARC was initially slow, however, gradually increased both in the US and in Europe. In 12 tertiary referral centers—whose experience has been collected in a multicenter collaboration study—RARC has overcome open surgery in the 2015–2018 period (54% vs. 46%) [5]. Notwithstanding some differences (an, i.e., a major use of neobladder in European countries), the global trend is similar, with blood loss and length of hospital stay favoring the robotic approach.

Randomized-controlled trials comparing open and robotic cases have become available [6], most of them dealing with perioperative and oncological outcomes. More recently, a meta-analysis of published RCTs has also been published [7], confirming a better trend for robotics for estimated blood loss, and oncological safety is similar to the one of the open surgeries.

Although many institutions acquired a robotic technology, learning curve (LC) and costs are the factors limiting an immediate widespread diffusion of RARC. Notwithstanding the topic of costs, that could vary across countries and requires detailed considerations, previous articles have addressed the concern of RARC-LC. According to Pruthi et al. [8] 20 procedures are required to complete the LC; besides, the IRCC stated that a minimum of 30 RARC would be needed to have PSM dropping below 5%. To this purpose, surgical fellowship or a focused BCa practice has been recommended before attempting the shift toward RARC. LC could also be more extensive if a totally

intracorporeal procedure is planned, with a modular training in referral centers being strongly advised [9].

As for many other countries worldwide, the da Vinci technology has been increasingly used in Brazil for radical prostatectomies. This experience with RALP has been described in some articles, with technical changes to improve functional outcomes [10, 11]. However, radical cystectomy has been performed with an open approach in Brazil so far. We sought to report the preliminary Brazilian experience with RARC, focusing on intra- and peri-operative outcomes to define the initial steps of such a transition.

With a median operative time of 420 min, RARC seems to be affordable since the very beginning of the LC when performed by surgeons already skilled in robotics. The operative time described in the literature for radical cystectomies ranges from 252 to 456 min [12–16]. This period length is intimately related to the urinary diversion chosen in the procedure, such as extracorporeal or intracorporeal reconstruction and lymph-node dissection [17]. Also, the intracorporeal anastomosis usually extends the operative time. In our practice, the majority of the cases, we performed intracorporeal Bricker urinary diversion that could extend our total operative time to 420 min presented. Even though our surgical time presented within the literature values [12, 18] and compatible with some tertiary referral centers with experienced robotic surgeons [24].

The type of diversion in this study was performed according to the surgeon's experience and choice. Although less than 5% of all RARC in the literature have intracorporeal urinary diversion [19], in our practice, this is the most frequently chosen reconstruction (68%). The Bricker technique, as aforementioned, was adopted in the majority of our diversions while some referral centers worldwide prefer neobladder [20].

Although we still do not have well-designed studies to conclude which diversion is the best for the patient, the International Robotic Cystectomy Consortium evaluated 935 patients and compared the extracorporeal vs. intracorporeal reconstruction. The authors described a lower risk of postoperative complications at 90 days for the intracorporeal procedure group [21].

Regarding the estimated blood loss (350 ml) presented in the current paper, our value is acceptable and close to some well-designed studies in the literature. The randomized single-center prospective study named RAZOR trial evaluated 350 patients who underwent a radical cystectomy and reported a mean blood loss of 363 ml for the RARC group [13].

Surgical complications are frequent events in cystectomies. The reconstructive part is the most frequent step linked with the morbidity and undesirable postoperative outcomes [22]. After 939 patients' analysis, Johar and colleagues

described 41% and 48% of complications within 30 and 90 days after surgery, respectively. Although the overall complication that we reported until 90 days after the procedure was lower (30%) with 50% of Clavien one or two, the mortality rate that we describe at 30 and 90 days (2%, 5%, and 5%, respectively) is consistent with the one reported by Johar et al. (4, 2%) [10].

Since most of the RARC that we reported were performed within the last year, mid- and long-term oncological outcomes are not available yet. However, immediate oncological results—i.e., surgical margin rate and lymph-node yield—are considered as surrogates of a safe transition to robotic surgery. The positive surgical margin rate within our first Brazilian cases is 5%, equal to the one reported by IRCC as the gold standard to be reached after the completion of LC (> 30 cases). Nix et al. [14] have proposed lymph-node yield as another oncological endpoint in radical cystectomies. The median number of nodes from the current Brazilian series (25 nodes) is overcoming the one reported by the authors in their non-inferiority study comparing robotic and open approaches (19 nodes in the robotic arm), confirming the feasibility of a safe procedure since the first cases. Accordingly, atypical sites of recurrences were not found in our short-term follow-up.

Summary

The limitation of the current study is its descriptive fashion without comparison with open or laparoscopic procedures. The fact that the current series comes from robotic referral centers could also be regarded as a limit, as outcomes could not be reproducible elsewhere. Additionally, we could not describe the survival and disease progression in 1 and 5 years, because most of the patients underwent surgery in the last year. We will consider that data in future publications.

However, this is the largest casuistic of robotic-assisted radical cystectomy reported since the first cases in Brazil and describes, in the follow-up period considered, similar outcomes when compared to referral centers worldwide.

Conclusion

Although RARC is challenging and the complications are common, the procedure is safe and feasible when performed by experienced robotic surgeons. We described our results since the first case in Brazil and concluded that, during the learning curve, it is possible to reproduce the technique and outcomes of referral centers with similar peri- and postoperative results.

Compliance with ethical standards

Conflict of interest Marcio Covas Moschovas, Daher Cesar Chade, Marco Antonio Arap, Alvaro Sadek Sarkis, William Carlos Nahas, Luiz Henrique Rodrigues Tanure, Gustavo Ebaid, Arnaldo Jose de Carvalho Fazoli, Giuliano Betoni Guglielmetti, Carolina Bistacco, Maurício Cordeiro, Paulo Afonso, Maria Chiara Sighinolfi, Bernardo Rocco, and Rafael Ferreira Coelho declare that they have no conflict of interest.

References

- Raza SJ, Wilson T, Peabody JO, Wiklund P, Scher DS, Al-Daghmin A (2015) Long-term oncologic outcomes following robot-assisted radical cystectomy: results from the International Robotic Cystectomy Consortium. *Eur Urol* 68:721–728
- Sathianathen NJ, Kalapara A, Frydenberg M, Lawrentschuk N, Weight CJ, Parekh D, Konety BR (2019) Robotic assisted radical cystectomy vs open radical cystectomy: systematic review and meta-analysis. *J Urol*. <https://doi.org/10.1016/j.juro.2018.10.006>
- Wiklund NP, Poulakis V (2011) Robotic neobladder. *BJU Int*. <https://doi.org/10.1111/j.1464-410x.2011.10307.x>
- Collins JW et al (2016) Enhanced recovery after robot-assisted radical cystectomy: EAU robotic urology section scientific working group consensus view. *Eur Urol* 70(4):649–660
- Zamboni Stefania et al (2019) Differences in trends in the use of robot-assisted and open radical cystectomy and changes over time in peri-operative outcomes among selected centres in North America and Europe: an international multicentre collaboration. *BJU*. <https://doi.org/10.1111/bju.14791>
- Bochner BH et al (2018) Randomized trial comparing open radical cystectomy and robot-assisted laparoscopic radical cystectomy: oncologic outcomes. *Eur Urol* 74(4):465–471
- Satknasivam Raj et al (2019) Robot-assisted radical cystectomy versus open radical cystectomy: a meta-analysis of oncologic, perioperative, and complication-related outcomes. *Eur Urol Oncol* 2(4):443–447
- Pruthi RS, Smith A, Wallen EM (2008) Evaluating the learning curve for robot-assisted laparoscopic radical cystectomy. *J Endourol* 22(11):2469–2474
- Porreca A, Bianchi FM, Romagnoli D et al (2019) Robot-assisted radical cystectomy with totally intracorporeal urinary diversion: surgical and early functional outcomes through the learning curve in a single high-volume center. *J Robotic Surg*. <https://doi.org/10.1007/s11701-019-00977-4>
- Neumaier MF et al (2019) Factors affecting urinary continence and sexual potency recovery after robotic-assisted radical prostatectomy. *Int Braz J Urol*. 45(4):703–712. <https://doi.org/10.1590/s1677-5538.ibju.2018.0704>
- Carvalho PA et al (2018) Retrograde release of the neurovascular bundle with preservation of dorsal venous complex during robot-assisted radical prostatectomy: optimizing functional outcomes. *Eur Urol*. <https://doi.org/10.1016/j.eururo.2018.07.003> (pii: S0302-2838(18)30481-0)
- Bochner BH, Dalbagni G, Sjoberg DD, Silberstein J, Keren Paz GE, Donat SM (2015) Comparing open radical cystectomy and robot-assisted laparoscopic radical cystectomy: a randomized clinical trial. *Eur Urol* 67:1042–1050
- Parekh D, Gables C (2017) A prospective multicenter randomized trial of open versus robotic radical cystectomy (RAZOR). *J Urol* 197:e918
- Nix J, Smith A, Kurpad R, Nielsen ME, Wallen EM, Pruthi RS (2010) Prospective randomized trial of robotic versus open radical cystectomy for bladder cancer; peri-operative and pathologic results. *Eur Urol* 57:196–201
- Parekh DJ, Messer J, Fitzgerald J, Ercole B, Svatek R (2013) Perioperative outcomes and oncologic efficacy from a pilot prospective randomized clinical trial of open versus robotic assisted radical cystectomy. *J Urol* 189:474–479
- Khan MS, Gan C, Ahmed K, Ahmad FI, Watkins J, Summers JA et al (2015) A single-centre early phase randomized controlled three-arm trial of open, robotic and laparoscopic radical cystectomy (CORAL). *Eur Urol* 69:613–621
- Hussein AA, May PR, Ahmed YE, Saar M, Wijburg CJ, Richstone L, Wagner A, Wilson T, Yuh B, Redorta JP, Dasgupta P, Kawa O, Khan MS, Menon M, Peabody JO, Hosseini A, Gaboardi F, Pini G, Schanne F, Mottrie A, Rha KH, Hemal A, Stockle M, Kelly J, Tan WS, Maatman TJ, Poulakis V, Kaouk J, Canda AE, Balbay MD, Wiklund P, Guru KA (2017) Development of a patient and institutional-based model for estimation of operative times for robot-assisted radical cystectomy: results from the International Robotic Cystectomy Consortium. *BJU Int* 120(5):695–701
- Parekh DJ et al (2018) Robot-assisted radical cystectomy versus open radical cystectomy in patients with bladder cancer (RAZOR): an open-label, randomised, phase 3, non-inferiority trial. *Lancet* 391(10139):2525–2536. [https://doi.org/10.1016/s0140-6736\(18\)30996-6](https://doi.org/10.1016/s0140-6736(18)30996-6)
- Lobo N, Thurairaja R, Nair R, Dasgupta P, Khanb (2018) Robot-assisted radical cystectomy with intracorporeal urinary diversion – the new ‘gold standard’? Evidence from a systematic review. *Pelvic Surg*. <https://doi.org/10.1016/j.aju.2018.01.006>
- Braschetti A, Möller A, Laurin O, Höijer J, Adding C, Miyakawa A, Hosseini A, Wiklund P (2018) Evolution of cystectomy care over an 11-year period in a high-volume tertiary referral centre. *BJU Int* 121(5):752–757
- Ahmed K, Khan SA, Hayn MH, Agarwal PK, Badani KK, Balbay MD et al (2014) Analysis of intracorporeal compared with extracorporeal urinary diversion after robot-assisted radical cystectomy: results from the international robotic cystectomy consortium. *Eur Urol* 65:340–347
- Novara G, De Marco V, Aragona M et al (2009) Complications and mortality after radical cystectomy for bladder transitional cell cancer. *J Urol* 182:914–921
- Johar RS, Hayn MH, Stegemann AP, Ahmed K, Agarwal P, Balbay MD, Hemal A, Kibel AS, Muhletaler F, Nepple K, Pattaras JG, Peabody JO, Palou Redorta J, Rha KH, Richstone L, Saar M, Schanne F, Scherr DS, Siemer S, Stökle M, Weizer A, Wiklund P, Wilson T, Woods M, Yuh B, Guru KA (2013) Complications after robot-assisted radical cystectomy: results from the International Robotic Cystectomy Consortium. *Eur Urol* 64(1):52–57
- Abreu AL, Chopra S, Azhar RA et al (2014) Robotic radical cystectomy and intracorporeal urinary diversion: the USC technique. *Indian J Urol* 30(3):300–306. <https://doi.org/10.4103/0970-1591.135673>

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