Case Report

Multiple bladder diverticula treated with robotic approach-assisted with cystoscopy

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Abstract

A bladder diverticulum (BD) is a herniation of the bladder urothelium through the muscular bladder wall. As a result, BD presents as a thin walled bag, urine filled connected to bladder lumen through a neck or ostium. The clinical problem with bladder diverticula is their poorly empty during micturition which results in multiple lower urinary tract symptoms as well as recurrent urinary tract infections. Bladder diverticula can be grossly classified in two groups as follows: congenital or acquired with different age presentation and etiological factors in each one. Vast majority of BD occur in adults especially in men. Acquired BD, are commonly diagnosed in the setting of neurogenic dysfunction or bladder outlet obstruction, they use to be multiple, associated with trabeculated bladder and prostatic enlargement.

Keywords: Bladder diverticula, cystoscopy-assisted, robotic approach

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INTRODUCTION

Bladder diverticula, unique or multiple, is a relatively frequent condition associated with several complications ranging from urinary tract infections to urinary retention with detriment of the lower urinary tract. Genetic disorders such as Ehlers Danlos or Williams Beuren syndrome have been associated with BD.[1] When there are multiple or very large bladder diverticula they affect normal storage and emptying of the bladder, significantly deteriorating the quality of life because of recurrent urinary tract infections or voiding disfunction. 90% of BD occur in adults with a male to female ratio of 9:1.[2] Acquired BD, also known as secondary, are most commonly diagnosed in the setting of neurogenic vesicourethral dysfunction or bladder outlet obstruction.[3] Acquired BD use to be multiple, associated with trabeculated bladder and prostatic enlargement in more than 70% of all cases.[4]

We present the case of a 56-year-old male with low urinary tract symptoms that are complicated by urinary retention. During the diagnostic protocol, multiple bladder diverticula are documented and surgical treatment is proposed through robot assisted laparoscopic diverticulectomy and cystoscopy. This approach let us resolve completly all of the diverticula with excellent postoperative results.

CASE REPORT

A previously healthy 56-year-old male patient with no

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history of chronical diseases presented with acute urinary retention. He was treated with transurethral catheter with a nonsuccessful attempt of catheter retirement. He was initially studied with bladder and prostate ultrasound showing bladder diverticula; forward we obtained a contrasted tomography evidencing 4 big diverticula in posterolateral walls [Figure 1], which are better appreciated in 3D reconstruction [Figure 2]. With this evidence, we decided to treat them surgically.

About surgical preparation, prophylactic parenteral third-generation cephalosporin antibiotics, and compression stockings were installed before the procedure. After general endotracheal anesthesia induction, the patient is positioned in the supine/lithotomy position and padded at all pressure points, with arms placed at patient's sides and legs separated in semi-flexion (conventional lithotomy position). The operating table was maintained in a significant Trendelenburg position for the duration of the procedure.

During initial cystoscopy 4 retrotrigonal diverticula were identified, registering, position into the bladder, neck size, and relation with urethral meatus, which were identified and left side cannulated with urethral stent due to nearness with one of the diverticula [Figure 3].

Pneumoperitoneum was archived with veress needle inserted at the conventional periumbilical position, and then replaced by a 12 mm lap-port introducing the scope for abdominal inspection. Four additional trocars were placed under direct vision: three 8 mm da Vinci© (Intuitive Surgical System) ports and an extra 12 mm regular port assistant. Pneumoperitoneum was established to 12–15 mmHg.

Using a 0° scope, the abdominal cavity is inspected with no evidence of adhesions. After docking the robot, extraperitoneal space is created in the parietal peritoneum. After entering Retzius space, BD are identified with cystoscopy assistance, dissecting their borders with arms 1 and 2, whereas the 3rd arm retracts bladder dome. Synchronic cystoscopy is performed in real time until both lenses meet [Figure 4].

Three bladder diverticula are obtained largest of them with 3.5 cm diameter, and the other two with 1.5 and 1 cm each [Figure 5]. The remaining one was enough small to be closed with a simple suture point.

Hydrodistention bladder test is performed with a transurethral catheter with no evidence of a fluid leak. Robotic arms are undocked with laparoscopic trocars retired closing the ports.

The patient is discharged 2 days after surgery, and the catheter is removed 4 weeks later performing a previous cystography without evidence of new diverticula. Three

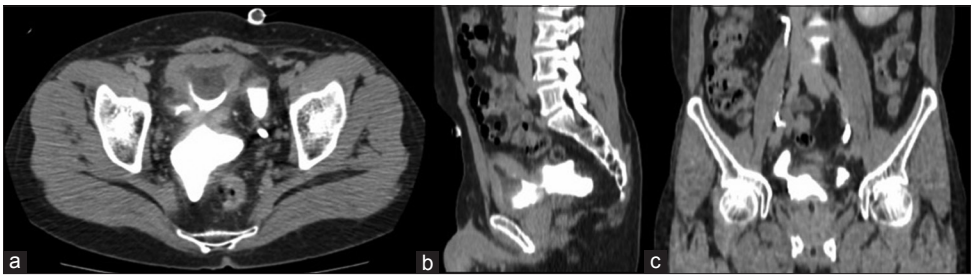

Figure 1: Computed tomography urogram showing (a) axial, (b) sagittal, and (c) coronal phases with 4 bladder diverticula in posterior wall

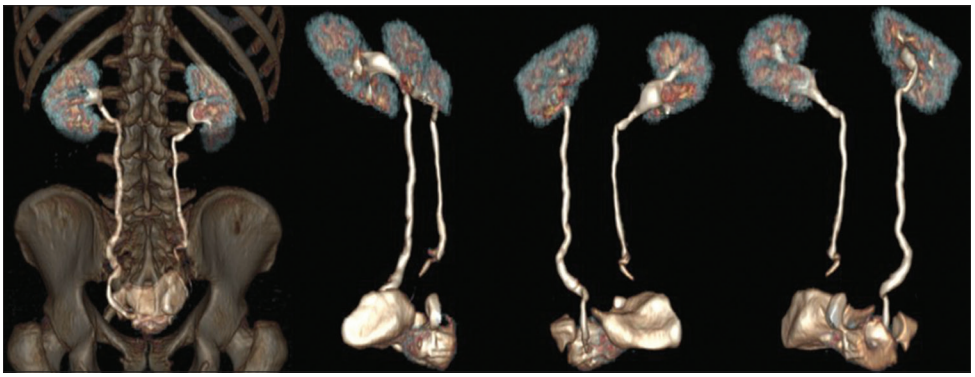

Figure 2: Three-dimensional reconstruction from computed tomography demonstrating multiple posterior wall bladder diverticulum

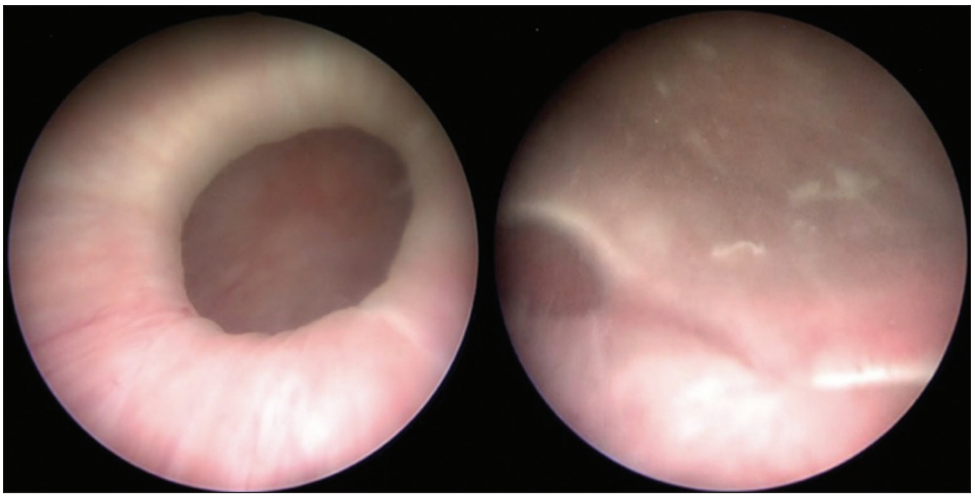

Figure 3: Endoscopic aspect of two of the bladder diverticula. Largest diverticulum with a bladder neck of approximately 3.5 cm

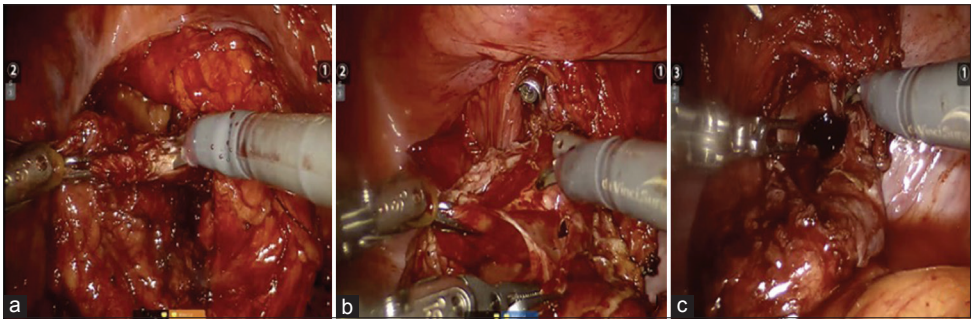

Figure 4: (a) Dissection and cut of one of the bladder diverticula with robotic scissors. (b) Real-time cystoscopy-assisted resection. (c) Bladder hole after diverticulum resection with muscular borders ready to be closed

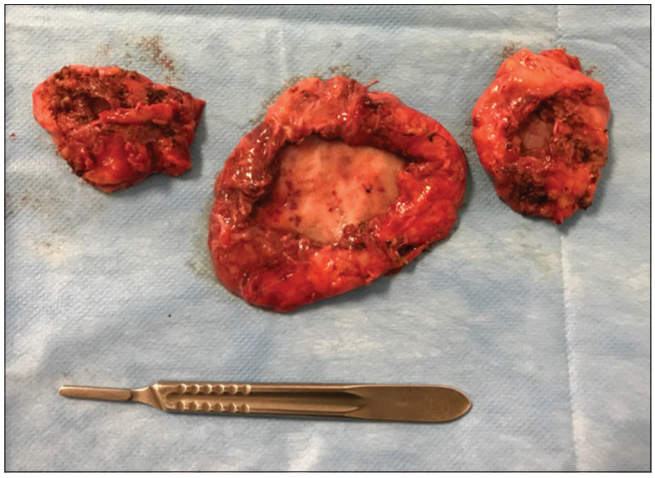

Figure 5: Three of bladder diverticular resected

months after surgery, his micturition is normal without new urinary tract infection (UTI) [Figure 6].

DISCUSSION

Bladder diverticula are important causes of lower urinary tract symptoms including bleeding, irritative voiding symptoms, and persistent or recurrent UTI. They usually occur in the context of some type of bladder outlet obstruction. When diverticulum is found superolateral to the ureteral meatus outside the trigone is known as "Hutch" diverticulum, which was first described in paraplegic patients thus is associated with bladder neurological diseases.

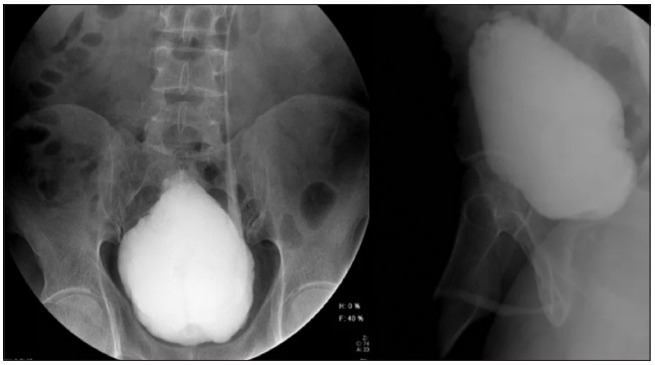

Figure 6: A month postsurgery cystography without evidence of bladder diverticulum

Celebi *et al*.[5] evaluated the effect of BD on bladder function using an animal model with rabbits testing the urodynamic profile and functional results of animals that

were inducted with BD. They found that BD effectively causes dysfunctional micturition with involuntary contractions, decreased storage capacity, and affects bladder compliance.

Surgical treatment is indicated in cases where urinary retention is as important that leads to absolute retention and severe symptoms as well as those diverticula susceptible to stone or tumor formation and perforation.

Surgical repair has been described with multiple techniques including open, endoscopic, or laparoscopic repairs. Orandi[6] described in 1977 the endoscopic technique in which the neck and the mucosa of the diverticulum are flashing which causes their subsequent involution. This technique has been used successfully in small to moderate-sized diverticula but carries the risk of potential perforation.

The open and laparoscopic approach conventionally implies a great surgical challenge due to the technical difficulties caused by the anatomy of the pelvis. Previously, Sivarajan *et al*.[7] used transabdominal robotic approaches to treat urethral diverticula which, as in our case, involve anatomical difficulties, highlighting the use of the robot, providing better exposure, facilitating dissection, and making it more precise while favoring the surgeon's vision and comfort with all the advantages of minimal invasion.

CONCLUSION AND LEARNING POINTS

The repair of BD by robot-assisted techniques is feasible, reproducible and with good results.

The use of the robotic technology is preferred in cases where the size or position of the BD involves an important technical difficulty with all the advantages of minimal invasive surgery.

Simultaneous cystoscopy provides technical safety, especially when the lesions are located near the ureteral meatus or the bladder anatomy is distorted.

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Conflicts of interest
There are no conflicts of interest.

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