

## Giant bladder diverticulum: A case report and review of the literature

Giant bladder diverticulum

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### Abstract

The bladder mucosa may herniate due to weak or low muscle structure of the bladder wall (congenital), infravesical obstruction, or increased intra-bladder pressure due to neurogenic disorders (acquired) or previous surgery. This condition is called bladder diverticulum. Here we present a case of giant bladder diverticulum and review of the current literature.

A giant bladder diverticulum measuring 17x13x10 cm and connecting to the bladder with an approximately 15 mm ostium was detected through the computed tomography (CT) scan of a 73-year-old male patient presenting with lower urinary tract symptoms. A cystoscopic evaluation was performed right after this, both prostate lobes were closing the bladder neck and the ostium between the bladder and diverticulum was visually identified. Open diverticulectomy was performed after transurethral prostate resection.

Giant bladder diverticulum may present with different symptoms. Although minimally invasive techniques (endoscopic, laparoscopic and robot-assisted) can be applied effectively, open surgical treatment is still a valid option.

### Keywords

Bladder diverticulum; Giant diverticulum; Open diverticulectomy

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## Introduction

Bladder diverticulum is defined as herniation of the bladder mucosa from a weak part of the muscularis propria layer in the bladder wall. Its incidence is approximately 1.7% and 1-6% in children and adults, respectively [1].

## Case Report

A 73-year-old male patient presented to our outpatient clinic with long-lasting severe lower urinary tract symptoms (LUTS) and abdominal distention. Of the LUTS, storage symptoms were prominent. Although he had undergone internal urethrotomy for urethral stenosis 20 years ago and had been receiving alpha-blocker treatment for eight years, his complaints persisted. On physical examination, there was a palpable swelling in the abdomen extending from the pubic symphysis to the epigastrium and was consistent with the globe vesicle (Figure 1). Urethral foley was inserted and 2000 cc of urine was drained. Renal function tests were normal. Abdominal ultrasonography revealed a giant cystic lesion extending from pelvic region to epigastrium. Upon this, an abdominopelvic computed tomography (CT) was performed and it showed a 17x13x10 cm size diverticulum, filling the left half of the pelvis almost completely, extending to the level of the L3 vertebra, compressing the bladder and prostate to the right, and attaching to the left lateral wall of the bladder with an approximately 15 mm ostium (Figures 2A and 2B). Then, transurethral prostate resection and open diverticulectomy operation was made and applied (Figure 3).

Together with our case, we summarized 18 cases of giant bladder diverticulum detected in adult patients in the literature since 1957 (Table 1).

## Discussion

Bladder diverticulum is basically divided into two classes as congenital and acquired. It can also be seen as iatrogenic [2]. Congenital diverticulum usually occurs at the ureterovesical junction or among the hypertrophic muscle bundles where the muscle tissue is poor in amount. They are usually asymptomatic and incidentally detected. [3]. These diverticulae are seen to peak during childhood, especially before the age of 10 years. This presentation can also be seen in elderly patients. Indeed, in an 83-year-old case published by Oliveira et al. in 2017, the patient was diagnosed with bilateral hydronephrosis secondary to urinary retention and acute renal failure [4]. The imaging and physical examination findings of our case were also consistent with urinary obstruction in the form of a vesical globe. Congenital diverticulae are usually seen in males, are solitary and larger than acquired ones. It is mostly localized to the posterolateral of the ureteric orifice. Acquired diverticula are often secondary to a bladder outlet obstruction or neurogenic vesicourethral dysfunction. It is frequently seen in men over 60 years of age and secondary to prostate enlargement by aging. They are mostly multiple and typically associated with marked bladder trabeculation [2]. Our case is also male as 16 of the 18 cases that we reviewed from the literature (Table 1).

The acquired type is usually narrow-mouthed and is more prone

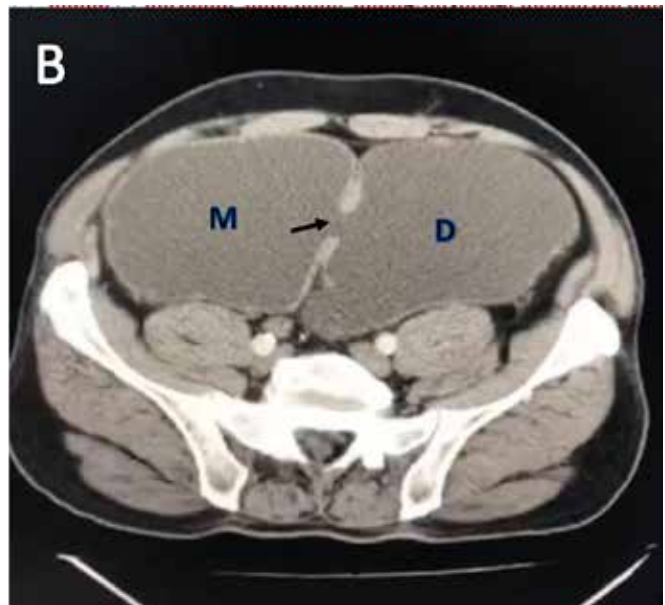
**Table 1.** Summary of 18 adult giant bladder diverticulum cases in the literature

Reference	Year	Age	Gender	Additional disease	Application Complaint	Diagnosis	Size	Treatment
Kauffman et al (3)	1957	70	M	Unspecified	Constipation	Plain X-ray, intravenous urography	17x13x13cm	Diverticulectomy
Taha et al (3)	1987	65	M	Unspecified	Abdominal distention, low urine flow	intravenous urography, CT	Unspecified	Reduction Cystoplasty
Farhi et al (3)	1991	31	K	Recurrent Urinary Infection	Ovarian cyst	USG, cystogram	10 cm	Unspecified
Adachi et al (10)	1991	68	M	Unspecified	Dysuria, intermittent urination	USG, intravenous urography	Unspecified	Transurethral fulguration of the diverticulum
Kwan et al (9)	1992	25	M	No	Frequency, intermittent urination	CT, cystogram	Unspecified	Intravesical diverticulectomy
Suzuki et al (3)	2002	84	M	Firearm injury to the bladder	Abdominal distention	CT, cystogram	Unspecified	Diverticulectomy
Siddiqui et al (3)	2003	77	M	TUR-P was applied twice due to urinary retention	Acute urinary retention	Intravenous urography	Unspecified	Diverticulectomy
Mirow et al (3)	2007	84	M	Sigmoid colon cancer	Abdominal pain, intestinal obstruction	Intraoperative	Unspecified	Diverticulectomy
Shaked et al (3)	2009	76	M	Hypertension, Diabetes Mellitus	Abdominal pain, constipation	CT	Unspecified	Unspecified
Akbulut et al (3)	2009	57	M	Laparotomy due to a traffic accident four years ago	Abdominal distention, pain, constipation, vomiting	Intravenous urography, CT	20 x 15 cm	Diverticulectomy
Lu et al (11)	2010	87	M	Unspecified	Frequency	USG, CT	24x23x15 cm	Unspecified
Hsu et al (12)	2011	73	M	No	Dysuria, noctury	USG, CT	15 cm	Follow-up
Tortoelli et al (13)	2011	73	M	Left donor nephrectomy	Abdominal distention, left leg paresthesia/hypoesthesia	USG, CT	10x9x9 cm	TURP + Open diverticulectomy
Kaneko et al (8)	2012	75	M	Hypertension, Hyperuricemia	Syncope	USG, CT	11x10x8 cm	TURP + Diverticulum cauterization
Kumar et al (6)	2014	74	M	Unspecified	Epigastric pain, dyspepsia, LUTS	USG, cystogram, CT	27x21 cm	Open prostatectomy + Diverticulectomy
Chang et al (2)	2015	41	M	Diabetes Mellitus, Mental retardation, Cerebral Palsy	Abdominal distention	CT	Unspecified	Diverticulum cauterization + Urinary diversion + Suprapubic cystostomy
Braga et al (14)	2016	63	K	Unspecified	Abdominal distention, tension	USG, Intraoperative, CT	8 cm	Unspecified
Oliveira et al (4)	2017	83	M	TUR-P three months ago	Acute urinary retention	USG	Unspecified	Diverticulectomy

USG: Ultrasonography; CT: computed tomography; TURP: Transurethral prostate resection



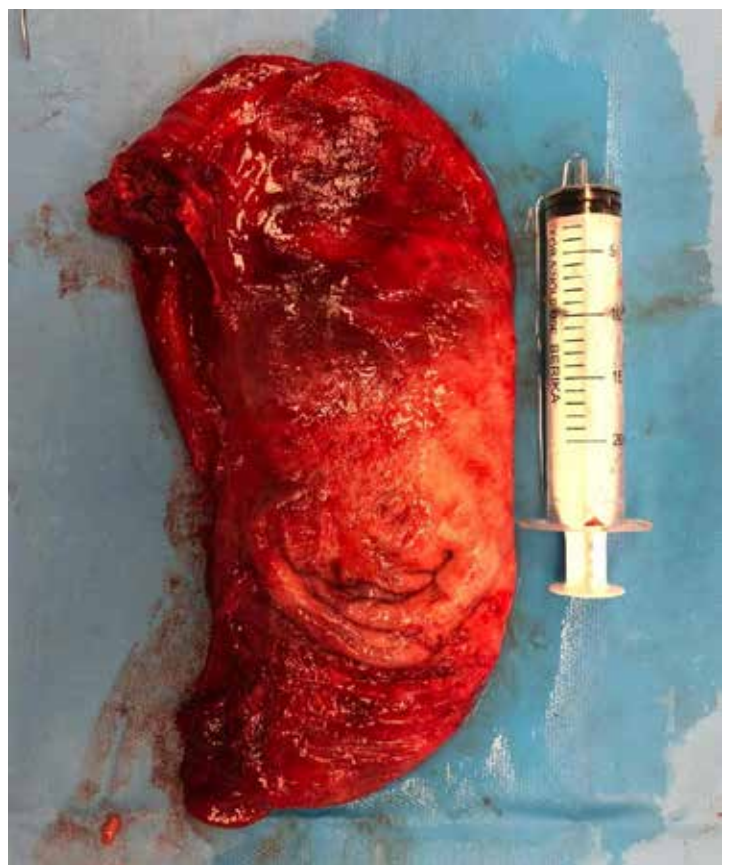
**Figure 1.** Palpable swelling in the abdomen extending from the pubic symphysis to the epigastrium



**Figure 2B.** Axial section of abdominopelvic CT image showing giant bladder diverticulum (D), bladder (B) and ostium (black arrow) forming the passage between two compartments



**Figure 2A.** Sagittal section of abdominopelvic CT image showing 17x13x10 cm size giant bladder diverticulum



**Figure 3.** Diverticulectomy material

to stasis and infection than the wide-mouthed type (congenital type), since the urine in it slowly drains into the bladder [5]. Bladder diverticulum may become larger than the bladder itself by expanding when the bladder is emptied. According to the literature research, the largest bladder diverticulum recorded so far is the 27x21 cm giant diverticulum presented by Kumar et al. [6].

Acquired bladder diverticula usually do not cause symptoms. Many bladder diverticula are detected incidentally during radiological or endoscopic examination of nonspecific LUTS, hematuria or infectious conditions [7]. Although they are very rare, they may cause gastrointestinal obstruction and acute abdomen. Mirow et al. operated their patient due to an acute abdomen, a giant bladder diverticulum was detected intraoperatively and diverticulectomy was performed [3].

Abdominal ultrasonography (USG) and contrasted abdominopelvic CT are frequently preferred methods for determining the size, location, accompanying pathologies of the diverticulum and dilatation secondary to renal obstruction. Voiding cystourethrogram may provide valuable information, especially accompanying vesicoureteral reflux. Cystoscopic examination of bladder diverticula for stone and tumor, cytology sample from the diverticulum and biopsy of abnormal mucosal areas are recommended [2]. Sometimes diverticula can cause recurrent urinary tract infections (up to 68%), malignant intradiverticular tumors (2-20%), vesicoureteral reflux or ureteral obstructions (5-15%), and spontaneous rupture [7]. The absence of muscle structure in the wall of the bladder diverticulum paves the way for a faster invasion of an intradiverticular tumor into the perivesical adipose tissue. Grade is more important than stage in these tumors. Abdominal complaints were present in 10 of 18 cases in Table 1, while LUTS were present in the remaining 8 just as in our case. In the case of Kaneko et al., neural-induced syncope was accompanied by chronic urinary retention [8].

Treatment options for bladder diverticula include follow-up or surgery (endoscopic, laparoscopic, robotic or open). Endoscopic treatment can be applied to elderly patients who are not good candidates for open surgery, who will undergo endoscopic prostate surgery and who have a diverticular drainage disorder. The aim is to resect the diverticulum neck with a Collins knife or resectoscope loop, to dilate the narrow neck and to ensure complete emptying during voiding. Open prostatectomy and transvesical diverticulectomy can be performed in the same session in cases with large prostate and obstruction. Combined intravesical / extravesical approach should be preferred in cases with large diverticulum, peridiverticular inflammation and/or coexistence of ureteral pseudodiverticula [2]. Transurethral resection of the prostate and open diverticulectomy was performed in our case. Of the 18 cases reviewed, 9 had open diverticulectomy, 3 had endoscopic treatment, and 1 had reduction cystoplasty. One patient was followed up and treatment methods of 4 patients were unspecified. All authors performed extravesical diverticulectomy except Kwan et al. They chose intravesical approach [9].

Indications for surgical treatment of bladder diverticula are persistent and recurrent urinary tract infections, the presence of stones or tumors in the diverticulum, vesicocutaneous fistula,

LUTS, and the presence of vesicoureteral reflux [2]. In our case, the indication for surgical treatment was severe LUTS with storage symptoms at the forefront.

Consequently, giant bladder diverticula may present with different symptoms. Endoscopic treatment can be applied effectively and open surgery is still a valid option.

#### **Scientific Responsibility Statement**

*The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.*

#### **Animal and human rights statement**

*All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.*

#### **Conflict of interest**

*None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.*

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