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

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

Giant bladder diverticulum

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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 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).

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

<table>
<thead>
<tr>
<th>Reference</th>
<th>Year</th>
<th>Age</th>
<th>Gender</th>
<th>Additional disease</th>
<th>Application Complaint</th>
<th>Diagnosis</th>
<th>Size</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kauffman et al (3)</td>
<td>1957</td>
<td>70 M</td>
<td>Unspecified</td>
<td></td>
<td>Constipation</td>
<td>Plain X-ray, intravenous urography</td>
<td>17x13x13 cm</td>
<td>Diverticulectomy</td>
</tr>
<tr>
<td>Taha et al (3)</td>
<td>1987</td>
<td>65 M</td>
<td>Unspecified</td>
<td></td>
<td>Abdominal distention, low urine flow</td>
<td>Intravenous urography, CT</td>
<td>Unspecified</td>
<td>Reduction Cystoplasty</td>
</tr>
<tr>
<td>Farhi et al (3)</td>
<td>1991</td>
<td>31 K</td>
<td>Recurrent Urinary Infection</td>
<td>Ovarian cyst</td>
<td>USG, cystogram</td>
<td>10 cm</td>
<td>Unspecified</td>
<td></td>
</tr>
<tr>
<td>Adachi et al (10)</td>
<td>1991</td>
<td>68 M</td>
<td>Unspecified</td>
<td></td>
<td>Dysturia, intermittent urination</td>
<td>USG, intravenous urography</td>
<td>Unspecified</td>
<td>Transurethral fulguration of the diverticulum</td>
</tr>
<tr>
<td>Kwan et al (9)</td>
<td>1992</td>
<td>25 M</td>
<td>No</td>
<td>Frequency, intermittent urination</td>
<td>CT, cystogram</td>
<td>Unspecified</td>
<td>Intravesical diverticulectomy</td>
<td></td>
</tr>
<tr>
<td>Suzuki et al (3)</td>
<td>2002</td>
<td>84 M</td>
<td>Firearm injury to the bladder</td>
<td>Abdominal distention</td>
<td>CT, cystogram</td>
<td>Unspecified</td>
<td>Diverticulectomy</td>
<td></td>
</tr>
<tr>
<td>Siddiqui et al (3)</td>
<td>2003</td>
<td>77 M</td>
<td>TUR-P was applied twice due to urinary retention</td>
<td>Acute urinary retention</td>
<td>Intravenous urography</td>
<td>Unspecified</td>
<td>Diverticulectomy</td>
<td></td>
</tr>
<tr>
<td>Mirov et al (3)</td>
<td>2007</td>
<td>84 M</td>
<td>Sigmoid colon cancer</td>
<td>Abdominal pain, intestinal obstruction</td>
<td>Intraoperative</td>
<td>Unspecified</td>
<td>Diverticulectomy</td>
<td></td>
</tr>
<tr>
<td>Shaked et al (3)</td>
<td>2009</td>
<td>76 M</td>
<td>Hypertension, Diabetes Mellitus</td>
<td>Abdominal pain, constipation</td>
<td>CT</td>
<td>Unspecified</td>
<td>Unspecified</td>
<td></td>
</tr>
<tr>
<td>Akbulut et al (3)</td>
<td>2009</td>
<td>57 M</td>
<td>Laparotomy due to a traffic accident four years ago</td>
<td>Abdominal distention, pain, constipation, vomiting</td>
<td>Intravenous urography, CT</td>
<td>20 x 15 cm</td>
<td>Diverticulectomy</td>
<td></td>
</tr>
<tr>
<td>Lu et al (11)</td>
<td>2010</td>
<td>87 M</td>
<td>Unspecified</td>
<td>Frequency</td>
<td>USG, CT</td>
<td>24x23x15 cm</td>
<td>Unspecified</td>
<td></td>
</tr>
<tr>
<td>Hsu et al (12)</td>
<td>2011</td>
<td>73 M</td>
<td>No</td>
<td>Dysturia, nocturia</td>
<td>USG, CT</td>
<td>15 cm</td>
<td>Follow-up</td>
<td></td>
</tr>
<tr>
<td>Torteoli et al (13)</td>
<td>2011</td>
<td>73 M</td>
<td>Left donor nephrectomy</td>
<td>Abdominal distention, left leg paresis/hypoparesis</td>
<td>USG, CT</td>
<td>100x90 cm</td>
<td>TURP + Open diverticulectomy</td>
<td></td>
</tr>
<tr>
<td>Kaneko et al (8)</td>
<td>2012</td>
<td>75 M</td>
<td>Hypertension, Hypercalcemia</td>
<td>Symptole</td>
<td>USG, CT</td>
<td>11x10x8 cm</td>
<td>TURP + Diverticulum cataractization</td>
<td></td>
</tr>
<tr>
<td>Kumar et al (6)</td>
<td>2014</td>
<td>74 M</td>
<td>Unspecified</td>
<td></td>
<td>Epigastric pain, dyspepsia, LUTS</td>
<td>USG, cystogram, CT</td>
<td>27x21 cm</td>
<td>Open prostatectomy + Diverticulectomy</td>
</tr>
<tr>
<td>Chang et al (2)</td>
<td>2015</td>
<td>41 M</td>
<td>Diabetes Mellitus, Mental retardation, Cerebral Palsy</td>
<td>Abdominal distention</td>
<td>CT</td>
<td>Unspecified</td>
<td>Diverticulum cataractization + Urinary diversion + Suprapubic cystostomy</td>
<td></td>
</tr>
<tr>
<td>Braga et al (14)</td>
<td>2016</td>
<td>63 K</td>
<td>Unspecified</td>
<td></td>
<td>Abdominal distention, tension</td>
<td>USG, Intraoperative, CT</td>
<td>8 cm</td>
<td>Unspecified</td>
</tr>
<tr>
<td>Oliveira et al (4)</td>
<td>2017</td>
<td>83 M</td>
<td>TUR-P three months ago</td>
<td></td>
<td>Acute urinary retention</td>
<td>USG</td>
<td>Unspecified</td>
<td>Diverticulectomy</td>
</tr>
</tbody>
</table>

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

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 3. Diverticulectomy material.
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. Voids 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 intraoperatively 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 pseudo diverticula [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.

References

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