Trauma and reconstruction

Congenital bladder diverticulum in a child: Surgical steps of extra-vesical excision

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Introduction

Bladder diverticulum is a large herniation of the bladder urothelium through the muscularis propria of the bladder wall\textsuperscript{1,2}. A fibrous capsule or pseudocapsule outer shell is often present and may be a useful surgical plane for excision. The outside wall of the bladder diverticulum often contains some residual scattered strands or bundles of disorganized and nonfunctional smooth muscle. The bladder diverticula generally empty poorly during micturition, leaving a large postvoid residual urine volume that results in the characteristic findings on presentation and imaging.

Congenital diverticula are known to present during childhood, with a peak incidence of 10 years or less\textsuperscript{3}. These are usually solitary, occur most commonly in males,\textsuperscript{2,3} and are located lateral and posterior to the ureteral orifice, often in association with vesicoureteral reflux.\textsuperscript{5} The primary cause of these diverticula in the pediatric age group is generally thought to be a congenital weakness of the detrusor muscle, most often at the level of the ureterovesical junction with or without coexistent lower urinary tract abnormalities.\textsuperscript{5}

Options in the treatment of bladder diverticula include observation, endoscopic management, and surgical excision. Open excision is performed either through a transvesical approach, an extravesical approach or a combined approach. Minimally invasive procedures, such as laparoscopy and robotics, have also been described and reported as to how to perform surgical diverticulectomy.\textsuperscript{4} We report a case of congenital bladder diverticulum presenting in an adolescent.

Case report

A 16 year old male child presented to the Pediatric urological services of the hospital with complaints of recurrent urinary tract infections (UTI) and lower abdominal pain of six months duration. The child also complained of poor flow and sense of incomplete evacuation. The child was treated with antibiotics and antipyretics by local doctors and referred to us for further management. Urine examination showed plenty of pus cells and bacteria. Urine culture showed \textit{E. coli} growth sensitive to multiple antibiotics. Ultrasonography of the abdomen revealed a well distended bladder with wall thickening and features suggestive of cystitis (Fig. 1a). A bladder diverticulum measuring 63 × 37 mm arising from the right half of the posterior wall adjacent to the vesico-ureteric junction (VUJ). Post-void bladder urine volume was 285 cc.

Computed tomography of the abdomen and pelvis showed a bladder diverticulum of 48 × 45 × 100 mm in dimension, arising near the right VUJ (Fig. 1b и c). The right ureter was dilated. A diagnosis of congenital bladder diverticulum was made. Cystoscopy was done and it showed a diverticulum with a narrow mouth (about 10 mm in diameter) at the right end of the trigone (Fig. 1d). The right ureteric orifice could not be made out.

Surgical technique

The patient was positioned under general anesthesia in a supine position with a tilt towards the left side. A pfannellstein incision was taken with extension of the incision on the right side towards the anterior superior iliac spine. The abdomen was opened in layers. The right ureter was traced at the level of its crossing over the iliac vessels. The anterior portion of the bladder was similarly identified and defined. The bladder and other tissues were dissected and pushed medially from the right pelvic wall.

The right ureter was dissected towards the bladder, to identify the diverticulum and the neck of the diverticulum (Fig. 2 a, b, c, d). The diverticulum was huge and adherent to the surrounding structures and hence it was decided to perform an extra-vesical dissection. The diverticulum and the right ureter were dissected with a combination of sharp and blunt dissection towards the bladder. The neck of the
A diverticulum was identified (Fig. 3a & b). The ureter was seen to enter the diverticulum about 2 cm from the neck. The diverticulum was dissected out from the bladder at the neck. Appropriate length of ureter was left and diverticulum excised. The ureter was re-implanted into the bladder after creation of a submucosal tunnel (Fig. 3c & d). A 5Fr. 26 cm double J stent was left in place. The bladder opening was closed after keeping a 22 Fr. Foley per-urethral catheter. A drain was left in the retroperitoneal area and the abdomen closed in layers. The drain was removed after 48 hours and the urethral catheter after 10 days. The patient had an uneventful recovery.

Discussion

Bladder diverticulum is a rare urinary tract malformation. Kelalis had defined it as a bladder protrusion with a diameter greater than 2 cm. Congenital bladder diverticulum is uncommon in children with an incidence of 1.7%. Indications for bladder diverticulectomy include the lower urinary tract symptoms related to the diverticulum that are not otherwise responsive to medical therapy, or for the major complications directly related to it such as persistent symptoms, chronic re-lapsing UTI, stones within the diverticulum, carcinoma or premalignant change, and upper urinary tract deterioration as a result of obstruction or reflux.

Transvesical diverticulectomy is the recommended procedure by most surgeons. The transvesical approach to bladder diverticulectomy was first reported by Hugh Hampton Young in 1906. It allows for complete correction of accompanying pathology (ureteral re-implantation for reflux), along with excision of the diverticulum and restoring the integrity of the bladder wall, with minimal complications and no morbidity regarding long-term bladder function. Khemakhem et al. used this technique in almost all cases with good results (6/7 cases).

In cases of large diverticula and/or considerable peridiverticular inflammation, a purely transvesical approach may not be feasible. Moreover the ureter being in close proximity to the diverticulum or, involvement of the ureter within the diverticulum or severe peri-diverticular inflammation encompassing the ureter may have altered the usual course of the ureter and may incur a prohibitive risk of injuring the ureter with a pure transvesical approach. In such cases either an extra-vesical approach or a combined intravesical and extra-vesical approach may be used.

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