CLINICAL CASE

Congenital bladder diverticulum: cause of urinary tract obstruction

Á. Gurrola-Ortega* and R.A. Alba-Palacios

General and Pediatric Surgery Service, Hospital General de Cuernavaca José G. Parres, Secretaría de Salud del Estado de Morelos, Cuernavaca, Morelos, Mexico

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Abstract The clinical case of a 2-month-old male infant is described herein. The patient was admitted to the Pediatric Surgery Service of the Hospital G. Parres with symptoms of urosepsis due to Enterococcus. His past history included bilateral hydronephrosis and an ultrasound study revealed a distended bladder. A urinary diversion with catheter was performed and the patient was referred to our institution due to obstructive uropathy.

Imaging studies were carried out for the diagnostic approach. A voiding cystogram was performed on 29.9.09 that showed a septate bladder communicating directly with the urethra and grade III vesicoureteral reflux. Computed tomography urography was ordered and revealed a right paraureteral bladder diverticulum and grade II vesicoureteral reflux.

Urethrocystoscopy was performed and showed a very large bladder diverticulum at the right wall; the left ureteral meatus was not observed. A kidney scintigram done on 14.12.09 identified bilateral renal pelvis dilation, right ureterocele, and grade III bilateral vesicoureteral reflux. Kidney function was within normal limits: right kidney 46.1 (41%) and left kidney 66.2 (59%).

The diverticulum was resected and a right Politano-Leadbetter ureteral reimplantation with bladder floor repair was performed on 15.02.10. A voiding cystogram carried out on 04.05.10 showed a bladder with irregular borders and a capacity of 50 cc, a neck with adequate opening, no reflux, and a permeable urethral tract. At 11 months the patient was asymptomatic and no longer undergoing antibiotic prophylaxis.

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Case presentation

A 2-month-old male infant had the following past history: his 32-year-old mother had ingested quinolones in the first trimester of her pregnancy, as well as cannabis on 2 occasions; 2 obstetric ultrasound studies at gestation week 18.5 and 36.3 showed no alterations.

At day 7 of extrauterine life, the patient presented with postprandial vomiting 2-3 times a day, accompanied with abdominal distension, irritability, and pain upon bowel movements and was treated with metoclopramide with no improvement. He later presented with dribbling micturition with reduced micturition frequency and quantity, with an increase in volume at the suprapubic level. On 11.09.09 an abdominal US study was done due to the suspicion of hypertrophic stricture of the pylorus that revealed a round, space-occupying lesion at the level of the hypogastrium with a 64.3 x 72.9 mm cystic component, displacement toward the left hemiabdomen of still undetermined etiology, and bilateral hydronephrosis. A kidney ultrasound study on 12.09.09 reported bilateral hydronephrosis and a distended bladder with an approximate volume of 227 cc and the presence of a posterior saccule. A bladder probe by a physician was performed and the patient was referred to a secondary care hospital. An ultrasound study confirmed the diagnosis of bilateral hydronephrosis and thickening of the bladder. The septate bladder was in the shape of an “8” with a 4 mm communication between the 2 portions. Renal function was evaluated and reported as conserved, with a serum creatinine level of 0.22.

Upon his admission to our unit, the patient was diagnosed with urosepsis due to Enterobacter cloacae that was sensitive to ceftazidime. Remission of the condition was achieved after 8 days of treatment. He also presented with regenerative anemia that was managed with ferrous sulfate.

A voiding cystogram was done on 29.09.09 that showed a septate bladder that communicated directly with the urethra and right, grade III vesicoureteral reflux (fig. 1).

Due to the findings in the previous imaging study, a CT-urography scan was ordered that revealed a right paraureteral bladder diverticulum and grade II vesicoureteral reflux (figs. 2 and 3). The patient was asymptomatic during and after the study.

Urethrocystoscopy was performed on 05.11.09 and identified a very large right diverticulum. The left ureteral meatus was not observed.

A kidney scintigram on 14.12.09 showed bilateral pyelocaliectasis, right ureterocele, and grade III bilateral vesicoureteral reflux. Renal function was within normal limits: right kidney 46.1 (41%), left kidney 66.2 (59%).

On 15.02.10 resection of the diverticulum and a right Politano Leadbetter ureteral reimplantation with bladder floor repair were performed. Findings: a diverticulum taking up two-thirds of the bladder capacity was dissected and completely resected. The Politano ureteral reimplantation...
was carried out with a 3 cm submucosal tunnel fixed to the poorly developed trigone and the bilateral ureteral diversion (contra-opening and bladder diversion) was performed with no complications.

A kidney ultrasound on 09.03.10 showed both kidneys with normal thickness and echogenicity, prominent pyramids, and moderately dilated small pelvises and calyces. Bladder content was anechoic and its wall thickness was normal with a lobular image, like a pseudodiverticulum, at a right angle.

A voiding cystogram performed on 04.05.10 revealed a bladder with irregular edges and a capacity of 50 cc, adequate neck opening, no reflux, and a permeable urethra in its entirety.

Eleven months later, on 08.07.10, the patient was asymptomatic and no longer receiving antibiotic prophylaxis. His latest urinalysis was a transparent yellow with a density of 1.021, pH 5, negative nitrites, leukocytes 0-1 per field, and scant bacteria. Blood chemistry reported urea of 29 mg/100 ml and creatinine of 0.4 mg/100 ml.

**Case review**

The most frequent causes of lower urinary tract obstruction in relation to bladder outlet in infants are anatomic alterations such as posterior urethral valves (being the first cause), meatal stricture, urethral stricture, congenital absence of the urethra, and bladder diverticulum.1

Bladder diverticulum is a rare cause of bladder outlet alteration and its incidence is unknown. However, with the advent of ultrasound, incidence has been reported at 0.7 to 1.7%.

Within the history of bladder diverticulum, cases have been reported since 600 B.C.E. in the Sushruta Samhita of the Ayurveda, as well cases of bladder stones. In 1750, Morgagni described congenital bladder sacculations. In 1952, Hutch reported on the presence of bladder diverticulum associated with the location of the ureteral meatus in paraplegic patients, and in 1961 it was reported in patients with no bladder or neurologic alterations.1 Thus it began to be classified as primary and secondary bladder diverticulum, the latter related to certain syndromes (William’s syndrome) or of iatrogenic origin (stricture secondary to a surgical procedure).1 One of the theories as to the origin of the bladder diverticulum is that hypoplasia of the muscular coat of the detrusor muscle causes “herniation” of the mucosa; another is that there is an embryologic origin in the Waldeyer sheath where the embryologic union is weaker (ureteral-submucosal with bladder trigone) or there is congenital detrusor muscle deficiency.1 Among the secondary causes, it has been reported that there is an increase in voiding pressure that causes bladder muscle distension and consequent herniation of the mucosa.

In regard to location with respect to the ureteral meatus, 10% have a posterolateral situation and are related to vesicoureteral reflux and 90% have a paraureteral situation. If multiple diverticula are found, they are usually associated with William’s syndrome or Ehlers-Danlos syndrome.1,3

Bladder diverticula are generally asymptomatic and are incidentally found in imaging studies ordered for recurrent urinary tract infections. When they are symptomatic, they usually present as lower urinary tract infection symptoms, hematuria, or abdominal and/or right flank pain.4

Voiding cystogram is the imaging study of choice that should be carried out in oblique projections to identify the presence of contrast material in the post-micturition phase. However, ultrasound also provides evidence of space-occupying lesions and ureterohydronephrosis data.1,4,6

Treatment is intra or extravasal diverticulum excision and the procedure can be open, endoscopic, laparoscopic, or laparoscopy plus urethrocystoscopy.1 No improvement has been seen in ureteral reimplantation compared with allowing naturally progression when vesicoureteral reflux is not associated with the diverticulum.
Ethical responsibilities

Protection of persons and animals. The authors declare that no experiments were performed on humans or animals for this study.

Data confidentiality. The authors declare that no patient data appear in this article.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Financial disclosure

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Conflict of interest

The authors declare that there is no conflict of interest.

References