Pediatrik Cerrahi Dergisi, 10:13-16, 1996

# Congenital bladder diverticula in children

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*Summary*

*Nine children within a group of 23 with bladder diverticula admitted between 1979-1995 had 11 primary congenital diverticulas of the bladder. The group consisted of 5 girls and 4 boys, with a mean age of 7.1 years. Differentiation of congenital and acquired bladder diverticula was based on voiding cystourethrography (VCUG), cystoscopy and urodynamic investigation. Recurrent urinary tract infection was the only symptom common to all cases. Intravenous urography demonstrated normal urinary tract in 5 cases, where voiding cystourethrography successfully visualized 8 diverticulas. The vesicoureteral reflux in the series was present in 3 cases, one of which was contralateral. Bilateral giant paraureteral diverticula led to loss of kidney function in one boy due to ureteral obstruction.*

*Five cases were managed by excision of the diverticulum alone. One underwent diverticulectomy with contralateral ureteral reimplantation. Initial bilateral diverticula excision and ureteroneocystostomy were performed to the case with bilateral giant diverticula, and unilateral nephroureterectomy with contralateral pyeloplasty for associated ureteropelvic junction obstruction was planned. Follow-up observation revealed no residual diverticula in any patient. Postoperative urinary tract infection was observed in only one case. Excision of the diverticulum alone is advocated for uncomplicated cases of congenital bladder diverticulum who have recurrent urinary tract infection, and ureteroneocystostomy is required for patients with high grade reflux or ureteral obstruction.*

***Key words:*** *Urinary bladder diverticulum, congenital anomalies*

## Introduction

Bladder outlet obstruction is a well-known cause of vesical diverticulum. However, a significant proportion of bladder diverticula especially in children are congenital in origin. Urinary tract infection (UTI) is the only common symptom in the majority of cases. They are mostly located in juxtaposition to the ureteral orifice, and less commonly bilateral. We present findings and result s of surgical treatment in a series of 11 presumed congenital bladder diverticula in 9 children.

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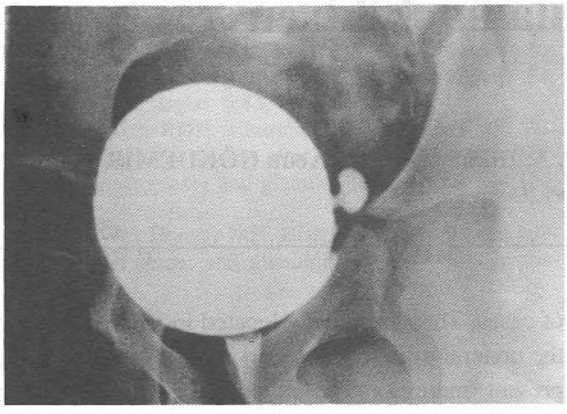
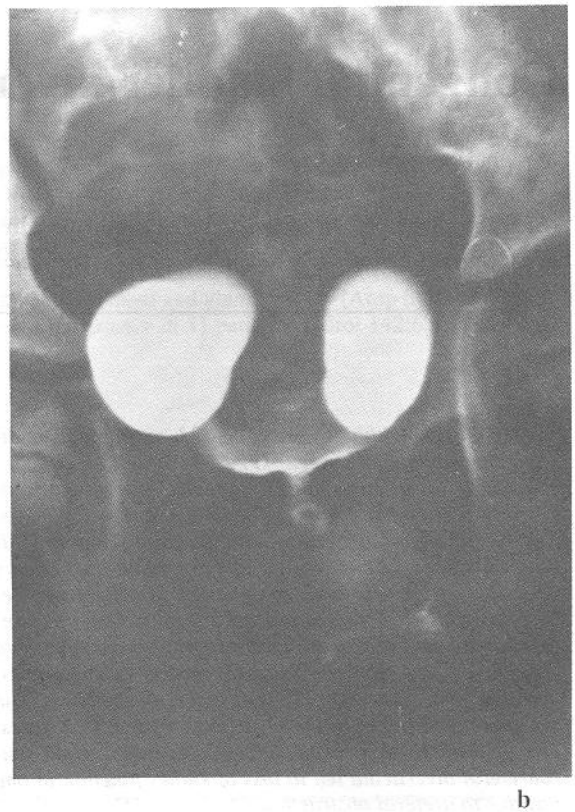
## Material and Method

*Nine children within a group of 23 with bladder diverticula admitted between 1979-1995 were found to have primary congenital diverticula of the bladder. The age of the patients at presentation was within a range of 5 to 12 years (mean 7.1 years), with a male to female ratio of 4/5. Recurrent UTI was the only common symptom leading to urologic investigation in all patients. The data including demographic values, investigations, findings related to the study are depicted in Table I.*

*Excretory urography (IVU) and voiding cystourethrography (VCUG) were performed in all patients (Fig. 1a and b). The diagnosis was confirmed by cystoscopy in 6 cases. Furthermore, IVU demonstrated diverticula in 2 patients. Cystoscopy was routinely performed to all patients in the last 10 years. Urodynamic investigations were performed in the most recent 4 cases and all of them were normal. VCUG, when confirmed by cystoscopy, gave the most accurate diagnosis. The single contralateral refluxing ureter in the whole series was demonstrated in one patient. There were also 2 cases with VUR on the ipsilateral side with the diverticulum. Upper urinary tract was normal in 5 out of 9 patients. One patient had pelvicaliectasis with ipsilateral diverticulum without VUR, possibly due to the obstructing effect of the diverticulum. Bilateral obstructing giant diverticula led to unilateral non-functioning kidney in one boy, who also had contralateral ureteropelvic junction (UPJ) obstruction.*





b

Fig. 1. Voiding cystograms of (a) patient no 4, (b) patient no 6.

## Results

Five children underwent diverticulectomy alone. Ureteroneocystostomy by Leadbetter-Politano technique was performed following diverticulectomy in both ureters of the patient with bilateral giant obstructing diverticula. Left nephrectomy, with contralateral pyeloplasty was indicated after 6 months of follow-up in this patient in whom no improvement

**Table I. Patient data including demographics, complaints, investigations**

| Patient no | Sex | Age (year) | Complaints | IVU | VCUG | Cystoscopy | Diverticulum size (cm) |
|---|---|---|---|---|---|---|---|
| 1 | M | 6 | Enuresis nocturna Hematuria, UTI | Normal | Right PUD Left VUR | Not performed | 2x2 |
| 2 | F | 12 | UTI | Normal | Right PUD | Not performed | 2x2 |
| 3 | F | 6 | UTI | Normal | Right lateral diverticulum Trabeculation | Not performed | 3x1.5 |
| 4 | F | 8 | UTI | Normal | Left PUD | Left PUD Trabeculation | 2x1.5 |
| 5 | F | 7 | UTI | Right PUD Right pelvicaliectasis | Right PUD | Right PUD | 1.5x1 |
| 6 | M | 6 | UTI | Left nonfunctioning kidney Right UPJ obstruction | Bilateral giant PUD | Bilateral giant PUD | R: 3x3 L:5x3 |
| 7 | F | 9 | Dysuria, UTI | Right PUD | Right PUD | Right PUD | 3x2 |
| 8 | M | 5 | UTI | Left pelvicaliectasis | Bilateral lateral diverticulum Left VUR | Bilateral lateral diverticulum | R:2x2 L:3x2 |
| 9 | M | 5 | UTI | Normal | Left VUR | Left PUD Trabeculation | 0.5x0.5 |

*IVU: excretory urography, PUD: paraureteral diverticulum, UPJ: ureteropelvic junction, UTI: urinary tract infection, VCUG: voiding cystourethrography, VUR: vesicoureteral reflux.*

**Table II. Treatment modalities and follow-up**

| Patient no | Treatment | Follow-up | |
|---|---|---|---|
| | | Urine | X-ray |
| 1 | Diverticulectomy<br>Left ureteroneocystostomy | Normal | No residual diverticula |
| 2 | Diverticulectomy | Normal | No residual diverticula |
| 3 | Diverticulectomy | Normal | No residual diverticula |
| 4 | Diverticulectomy | Normal | No residual diverticula |
| 5 | Diverticulectomy | Normal | No residual diverticula |
| 6 | Bilateral diverticulectomy<br>Ureteroneocystostomy | UTI | Unilateral UPJ obstruction<br>No residual diverticula |
| 7 | Diverticulectomy | Normal | No residual diverticula |
| 8 | Bilateral diverticulectomy<br>Left ureteroneocystostomy | Normal | No residual diverticula |
| 9 | Left diverticulectomy<br>Ureteroneocystostomy | Normal | No residual diverticula |

*UPJ: ureteropelvic junction, UTI: urinary tract infection.*

of left renal function was observed. In another patient, after the excision of the diverticula on the right side, the refluxing left ureter was reimplanted concomitantly with the same technique. Totally, ureteroneocystostomy was performed in 5 patients.

All patients received at least one month of antibiotic prophylaxis postoperatively. Urine analysis was made at 3 monthly intervals and a VCUG with IVU was performed in 6th postoperative month. The length of follow-up ranged from 9 months to 5 years. Postoperative UTI was observed in one patient, which resolved following antibiotic treatment. No residual diverticula was observed on control radiograms in any of the patient. Pelvicaliectasis due to obstructing diverticula in one patient subsided postoperatively.

VCUG of the patient with bilateral giant diverticula in 6th postoperative month showed a normal appearing bladder devoid of diverticula or reflux. However, the IVU failed to detect any function in the left which was confirmed later by scintiscan, and right UPJ obstruction was persisting. This patient is currently under control without UTI and chemotherapy. A right pyeloplasty with left nephrectomy is being considered at present. Treatment modalities and results of follow-up were shown in Table II.

## Discussion

There have been a few theories to explain the etiology of congenital bladder diverticula in the past, with no sound evidence to support them. However, an inherent weakness in the detrusor musculature is believed to be the cause in most of the cases [3]. The objective of explaining the exact cause lies in the significant difference between the managements of primary and acquired diverticula. Those diverticula due to bladder outlet obstruction, such as posterior urethral valves, urethral stricture, neurogenic bladder and voiding dysfunction are usually multiple in number, may be located anywhere in the bladder and often resolve after correction of the outlet obstruction. However, in most congenital diverticula except the ones associated with Ehler-Danlos, prune belly, and similar syndromes, surgical excision is the treatment of choice [4].

Paraureteral diverticula may cause VUR due to its distorting effect on ureterovesical angle or it may simply be associated with reflux [2,3,4]. Ureteral or urethral obstruction secondary to congenital bladder

diverticula has been reported [5,7]. The incidence of VUR with paraureteral diverticulum has a wide range in reported series. Seven of 11 diverticula in our series were located paraureterally, and 2 were associated with VUR. Barrett et al reported VUR in 83 of 89 diverticulum-ureteral units in their large series [2]. Allen and Atwell found a high incidence of VUR as well [1]. King stated that reflux was always involved only when the ureter actually enters the diverticulum, in his comment on the report of Barrett et al [2].

The relationship between the ureteral orifice and the diverticulum may play a role in the incidence of VUR and the type and result of treatment [6]. VUR in our series was detected in 3 cases, one of which was contralateral. Allen and Atwell reports 3 patients refluxing to the contralateral ureters in their series of 27 patients with paraureteral diverticula [1]. It is unknown whether there is a relationship between paraureteral diverticulum and contralateral VUR, or it is coincidental. Our series with 2 ipsilateral VUR associating with bladder diverticulum is composed of patients remaining after a meticulous exclusion of children with acquired diverticula.

The female preponderance is another different feature of our study group and with these properties it is a unique group of patients compared to the reported series in the literature. A review of the accessible Turkish literature could not reveal any report on congenital bladder diverticulum. VCUG is the diagnostic method of choice for bladder diverticula, especially when a postvoiding film is obtained. Since a distended bladder is required for most diverticula to become apparent, IVU may easily miss the diagnosis as in our cases. This is also true for cystoscopy, where diverticula are manifest only by mucosa that appears to be piled up around the orifices, even with the bladder full.

Barrett et al recommend excision of the diverticulum and reimplantation of the ureter in the presence of reflux and a paraureteral diverticulum [1]. However, there has been at least one report published more recently that demonstrates spontaneous regression of diverticula even with associated VUR. Ureteral reimplantation was applied bilaterally to the patient with giant obstructing diverticula in our series (case 6). Totally, 5 ureters were reimplanted. Other patients underwent excision of the diverticulum alone, which was proved to be adequate after reasonable periods of follow-up. The intravesical approach for the excision of diverticula is preferred. After invagination and excision of the herniated mucosa, the muscle layer is repaired securely.

Since all children in our series presented with recurrent UTI, we are unable to comment on expectant management for asymptomatic cases. However, we recommend surgical excision alone for uncomplicated cases of bladder diverticulum with recurrent UTI, and spare ureteroneocystostomy for patients having high grade VUR or ureteral obstruction.

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