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ORIGINAL ARTICLE

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Posterior urethral valves: incidence and progress of vesicoureteric reflux after primary fulguration

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Abstract This is a prospective study of 20 cases of posterior urethral valves (PUV) presenting between the ages of 12 days and 5.5 years (median 15 months) in order to determine the incidence and progress of vesicoureteric reflux (VUR), hydronephrosis (HN), and renal functional status. The efficacy of fulguration as the sole modality of treatment for PUV was assessed in terms of improvement or disappearance of VUR over a 6-month follow-up period. VUR was present in 60% of the patients, being unilateral in 41.7%. Out of 19 renal units with VUR, reflux subsided in 31.5% by 3 months and 78.94% by 6 months. The blood urea and serum creatinine levels, which were raised in 50% of the patients at presentation, came down to normal by 6 months in all the cases. Improvement in glomerular filtration rates (GFR) was noted in all the children at each follow-up and was found to be statistically significant ($p < 0.01$). HN was present in all the patients at presentation and was bilateral in 90%. It decreased significantly during the follow-up period, though its complete disappearance was seen only in one case. Vesicoureteric reflux dysplasia syndrome (VURD) was present in two cases. Our study showed that VUR disappeared in a majority of the cases by 6 months once adequate urethral patency was restored, although hydronephrosis persisted.

Keywords Posterior urethral valves · Vesicoureteric reflux · Fulguration · Hydronephrosis

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Introduction

Primary fulguration without upper tract diversion is the preferred modality of treatment in most cases of posterior urethral valves (PUV) [1]. Regular follow-up is needed to check completion of valve fulguration, renal function, status of hydronephrosis (HN), vesicoureteric reflux (VUR), urinary tract infection (UTI), and bladder function. Most of the available studies give widely variable data regarding the incidence of VUR, its course and correlation with renal function, with very few studies being available from the developing countries [2]. In view of the above picture, this study was conducted.

Methods

Twenty children between the ages of 12 days and 5.5 years (median 15 months), seen over a period of 2 years (January 1996 to December 1997), were evaluated. PUV patients treated by fulguration alone were included. All children were subjected to ultrasonography (USG), blood urea, serum creatinine, routine urine examination and culture studies. In the presence of uremia, sepsis, dehydration, and metabolic derangements, preliminary catheterization was done until the above parameters improved and the child was fit for anesthesia and surgery. Whereas the blood urea and creatinine levels were done immediately after admission, the ^{99m}Tc diethylene triamine pentaacetic acid (DTPA) scans were done electively after a period of catheterisation followed by fulguration. Many times there was a time lag between treatment of symptoms and the first DTPA scan, depending on the availability. PUV was confirmed on voiding cystourethrogram (VCUG) and at the same sitting, cystoscopy and fulguration of valves were done at 5, 7, and 12 o'clock positions using a 9-F resectoscope. VUR was graded according to the international grading system [3]. The urethral catheter was retained for 12–24 h and in uncomplicated cases the child was discharged on oral cotrimoxazole on the first postoperative day. In children with VUR, long-term uroprophylaxis and periodic urine cultures were advised. Patients were followed up at 3 and 6 months, when renal function tests, USG, routine urine examination and culture, and radionuclide cystourethrogram (RNCU) for VUR were carried out [4]. Glomerular filtration rate (GFR) was measured at presentation and each follow-up from the DTPA scan using the Gates method [5]. Statistical analysis was performed using a paired *t*-test and the Wilcoxon test.

Results

Out of 20 children, four were less than 1 month old, four were between 1 month and 1 year, and the other 12 were between 1 and 5.5 years. All the patients in the neonatal age group presented with poor urine output, dribbling of urine, palpable bladder, and poor feeding. Of the infants, three were diagnosed following recurrent UTIs and one for poor urine stream. Of the remaining 12 children, six presented with recurrent UTI, one with abdominal distension and dribbling, and five with straining at micturition and narrow urine stream. Two of the children with UTI had been referred for management of bilateral VUR.

The preoperative blood urea and serum creatinine were raised in 50% of the patients at presentation, which included all the children below 1 year. Blood urea levels ranged from 20–200 mg %, with a mean of 65.65 ± 55.12 mg %. The mean creatinine level was 1.32 ± 0.9 mg % (range 0.5–4.5 mg %). These values subsequently came down to 34.95 ± 12.08 mg % and 24.6 ± 6.58 mg % for blood urea and 0.81 ± 0.27 mg % and 0.6 ± 0.25 mg % for serum creatinine at the 3- and 6-month follow-ups. Mean GFR was 80.05 (corrected ml/min per 1.73 m^2) (range 60–96) during the first admission. Follow-up at 3 and 6 months showed mean GFR to be 86.63 (range 60–98) and 97.44 (corrected ml/min per 1.73 m^2) (range 86–126) respectively. This increase was statistically significant at each follow-up by *t*-test ($p < 0.01$). VUR was present in 12 (60%) cases at presentation. It was unilateral in five (41.7%), of which three (60%) were on the left side. In terms of renal units, reflux was present in 19 (47.5%) units preoperatively, in 13 (32.5%) at 3 months, and in four (10%) at 6 months (Table 1). The initial USG showed HN in all the cases, 90% being bilateral. At follow-up, only one child showed complete disappearance of HN. In the remaining children, there was statistically significant reduction in the grade of HN when Wilcoxon test was applied ($p < 0.05$) (Table 2). No correlation could be established between a decrease in VUR and improvement of GFR (Table 3). However, as the VUR decreased, blood urea and serum creatinine came to normal range, and the HN also improved.

Table 1 Progress of VUR following fulguration

Grade of VUR	Number of renal units (proportion)		
	Admission	First follow-up	Second follow-up
0	21 (52.5%)	27 (67.5%)	36 (90%)
I	2 (5%)	2(5%)	1 (2.5%)
II	0	4 (10%)	1 (2.5%)
III	4 (10%)	2 (5%)	1 (2.5%)
IV	6 (15%)	3 (7.5%)	1 (2.5%)
V	7 (17.5%)	2 (5%)	–
Total	40 (100%)	40 (100%)	40 (100%)

Discussion

In the present study, the median age was 15 months, distinctly a later presentation than that quoted in the western literature. This is known to be associated with a less severe form of PUV [6, 7]. The lower incidence of uremia and the return of BUN to normal in a short time after surgery also point to a milder form of renal damage in these children. The hydronephrosis disappeared completely only in one case, showing significant improvement in 44.7% of the cases. In the rest, it either remained static or showed marginal improvement. This has been observed in other studies also [8].

Reflux is the major cause of postnatal renal damage in PUV, and persistent reflux is associated with bad outcome [9]. Many studies have shown resolution of reflux in a significant number of patients following fulguration [10, 11]. Johnston and Kulatilake [10] reported VUR in 26% of the renal units, 56% being unilateral. Reflux subsided in 40% of the patients after fulguration. The time taken for resolution was as short as 2 weeks, though the maximum period remained unknown. A 66% incidence of VUR was reported by Johnston [11], 52% being unilateral. Reflux ceased in 55% in 2 weeks to 13 months. In another study, over a mean follow-up period of 6.3 years, reflux disappeared in 64% of the renal units [12]. It was observed in this study that reflux invariably resolved when there was functioning renal tissue. Our study showed 60% children having VUR at presentation, with 41.7% being unilateral. Reflux was present in 47.5% renal units initially, subsiding in 31.5% units by 3 months and in 78.9% by 6 months after fulguration. The remaining 3 units showed reduction in the grade of reflux. The incidence of disappearance of reflux in our study is therefore much higher than the 29–64% rate described earlier [8, 11, 12, 13]. Our study gives the timeframe of cessation of reflux, which has not been given in any of the previous studies.

Vesicoureteric reflux dysplasia (VURD) syndrome is comprised of unilateral reflux and ipsilateral dysplastic nonfunctioning kidney as described by Hoover and Duckett [14]. In their series of 82 patients, 17 (21%) had persistent unilateral reflux. Eleven (13.5%) patients with unilateral VUR and one with bilateral VUR had a nonfunctioning kidney. The nonfunctioning kidney was on the left side in 11 of the 12 cases. Left-sided VURD syndrome was found in only two patients in our study.

Table 2 Progress of hydronephrosis following fulguration

Grade of hydronephrosis	Number of renal units (proportion)		
	Admission	First follow-up	Second follow-up
0	2 (5%)	2 (5%)	4 (10%)
I	21 (52.55%)	22 (55%)	31 (77.5%)
II	8 (20%)	14 (35%)	3 (7.5%)
III	9 (22.5%)	2 (5%)	2 (5%)
Total	40 (100%)	40 (100%)	40 (100%)

Table 3 Changes in reflux grades and GFR before and after fulguration

Age	Reflux			GFR		
	At presentation L R	3/12 L R	6/12 L R	At presentation	3/12	6/12
≤ 1/12						
12 days	0 0			86	85	92
15 days	0 IV	0 II	0 0	77	95	98
26 days	0 0	0 0	0 0	81	–	–
30 days	0 0	0 0	0 0	75	98	88
1/12–1 year						
35 days	0 0	0 0	0 0	95	96	106
6 months	V V	IV IV	0 0	87	91	94
6 months	V I	III 0	I 0	87	89	91
10 months	0 0	0 0	0 0	74	80	86
1–5 years						
1 1/4	I IV	0 I	0 0	80	84	103
1 1/4	0 0	0 0	0 0	75	–	–
1 1/2	V IV	0 0	0 0	–	78	–
1 1/2	V III	V 0	0 0	60	84	96
1 1/2	IV 0	II 0	0 0	96	96	96
1 1/2	0 0	0 0	0 0	80		101
2	III 0	I 0	0 0	84	87	92
4	IV III	V 0	II 0	64	82	93
4	0 0	0 0	0 0	80	85	89
5	IV III	III II	0 0	89	96	126
5	0 V	0 II	0 0	87	–	108
5 1/2	V 0	IV 0	IV 0	64	60	–

One child had grade V reflux on the nonfunctioning left side with a contralateral grade III VUR. There was marginal improvement of differential GFR on the left side to 14 corrected ml/min per 1.73 m^2 at 3 months and 20 corrected ml/min per 1.73 m^2 at 6 months. The right side reflux had subsided completely at the 3-month followup. In the second case, the kidney remained functionless with persistent grade IV-V unilateral reflux at 3-month follow-up, although no reflux could be detected at 6 months. Both children underwent nephrectomy a year after initial fulguration. We feel that it is prudent to wait for at least 1 year after successful primary fulguration of valves to see if the kidney shows any improvement in function before contemplating any active intervention for the VUR.

The results of antireflux surgery in children with posterior urethral valves are not satisfactory [15]. Other methods such as endoscopic injection of antireflux agents could be a choice if cost is not a problem [16]. The two children with persistent (though downgraded) VUR in our series continue to be treated with long-term (5 years postop) uroprophylaxis without any ill effects, as per the parents' choice. VUR alone without renal dysplasia need not necessarily carry a poor prognosis and can be managed conservatively [17]. Studies in patients with valves and bilateral reflux have demonstrated an inverse relationship between filling detrusor pressure and GFR [18]. Although we could not derive any clear-cut correlation between the rise in GFR and the resolution of reflux, we feel that they are both secondary to the reduction in back pressure following adequate fulguration. Although our study group was small, we did not come across any patient with persistent bladder dysfunction. This series includes only those patients who underwent fulguration. The patients also presented later compared with western series and, as discussed earlier, represent a cohort of patients with a milder form of the disease. However, we feel that adequate fulguration is the key to improvement in reflux and renal function in the majority of cases.

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