RESEARCH PAPER

Outcome of Antenatally Presenting Posterior Urethral Valves (PUV) in Children

TP JOSEPH, VK GOPI, PR BABU AND KV SATISH KUMAR

From Department of Pediatric Surgery, Baby Memorial Hospital Ltd, Indira Gandhi Road, Calicut, Kerala, India.
Correspondence to: Dr Satish Kumar KV, 26/194 A, Sai Sannidhi, Vadakkathparamba, Govindapuram (PO), Calicut 673 016, Kerala, India. jorosamma@yahoo.com
Received: February 25, 2016; Initial review: May 19, 2016; Accepted: November 30, 2016.

Objective: To analyze the outcome of children with posterior urethral valves who presented with antenatal hydronephrosis.

Methods: A 10-year retrospective review of records of 70 children with posterior urethral valves.

Results: The mean (SD) gestational age at diagnosis was 34 (4.48) weeks, and age at intervention was 130.5 (170.9) days. The nadir creatinine was significantly raised (>1.2 mg/dl) in children with oligohydramnios and diversion.

Conclusion: All boys with antenatally detected hydronephrosis need postnatal evaluation to rule out posterior urethral valves. Short term outcome is improved with postnatal treatments, and longer follow-up is needed to ensure a favourable outcome.

Keywords: *Antenatal diagnosis, Hydronephrosis, Outcome, Ultrasound.*

Published online: December 05, 2016. PII:S097475591600030

Posterior urethral valves (PUV) are the most common cause of obstructive uropathy [1,2], and 25-30% of treated patients are at risk of developing End-stage renal disease (ESRD) [3,4]. Sixty percent of renal transplants in children are done for obstructive uropathy [5]. Routine use of antenatal ultrasound has led to posterior urethral valves (PUV) being increasingly diagnosed antenatally. Antenatal interventions are being carried out in specialized centers to improve postnatal outcome [6]. In centers without these facilities, better postnatal outcomes can be achieved with early treatment, prevention of infection, and long-term care.

METHODS

We conducted a 10-year (2005-2015) retrospective review of all operated cases of PUV, who had antenatal hydronephrosis. Antenatal ultrasound findings, clinical features, age at confirmation of diagnosis, biochemical abnormalities, surgical management and follow-up data were analyzed. Initial investigations included urinalysis, renal functions parameters (urea, creatinine and electrolytes) and renal ultrasound. The diagnosis was made by micturating cystourethrogram (MCU) and confirmed on cystourethroscopy.

The surgical treatment was cystourethroscopy and PUV ablation; diversion was reserved for patients where ablation was not advisable/feasible. Postoperatively, all patients received prophylactic oral antibiotics and oxybutynin (0.2 mg/kg/day), which was discontinued after toilet training, and when timed voiding was possible.

The renal function (nadir creatinine) was analyzed in relation to oligohydramnios, gestational status at delivery, age at intervention, mode of therapy (diversion/ PUV ablation), presence of vesicoureteral reflux (VUR) and preoperative infection. Initial creatinine of more than 0.6 mg/dL was considered as raised, and patients with nadir creatinine of more than 1.2 mg/dL at 6 months were considered to be at risk of progression to chronic renal insufficiency.

RESULTS

We managed 218 patients with PUV during the study period. Ninety-two (42.5%) had antenatal hydronephrosis; 81 of these were analyzed for this study (minimum of 6 months follow-up). Out of 81 children, 11 were excluded (2 died before treatment, one moved overseas after treatment, and 8 patients had insufficent data).

The mean (SD) gestational age at antenatal diagnosis was 34 (4.48) weeks, and mean (SD) age at intervention was 124 (147) days. The mean (SD) follow-up period was 39.2 (27.6) months, and mean (SD) age at last follow-up

WHAT THIS STUDY ADDS?

- Prenatally diagnosed PUV has good functional outcome.

was 43.4 (28) months. Twenty-five patients (33%) had VUR.

Sixty patients (85%) were managed by primary valve ablation and 15% underwent diversion, of which eight have been undiverted during follow-up. Two patients are still on diversion and two of the diverted patients died of renal failure.

The mean (SD) initial and nadir creatinine was 0.87 (0.98) mg/dL and 0.41 (0.35) mg/dL, respectively. Initial creatinine was raised in 24 (30%) patients. After treatment, 12 (15%) patients had nadir creatinine >1.2 mg/dL with a trend towards higher creatinine on follow-up (***Fig.* 1**).

Fifty-two patients could be assessed for voiding function. Three patients underwent ablation of residual valve and four of the toilet-trained patients had bladder dysfunction at last follow-up. On nuclear renal scans, eight patients had poorly functioning unilateral renal units (<10% function), and three underwent unilateral nephroureterectomy for recurrent urinary tract infections (UTI).

DISCUSSION

In our series of children antenatally diagnosed with posteriod urethral valves, thirty percent presented with raised peak creatinine (>0.6 mg/dL). Vesicoureteral reflux (VUR) was present in one-third of patients. Majority of our patients were managed by endoscopic valve ablation and 15% needed diversion due to persisting sepsis or progressive renal failure with electrolyte abnormalities.

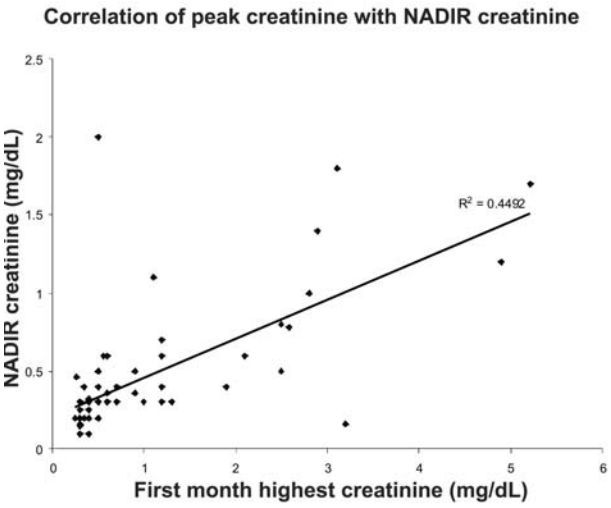

FIG. 1 *The correlation between peak creatinine and nadir creatinine over time.*

More than two-thirds of PUV are detected antenatally [7], but this proportion is less in developing countries [8]. The classical ultrasound features of PUV (hydronephrosis, distended/thickened bladder with dilated posterior urethra and oligohydramnios) are present in about one-third of scans [9]. As antenatal ultrasonography is not specific for PUV [10], careful postnatal evaluation is warranted.

The treatment is mainly endoscopic valve ablation, and diversion is used for those with persisting sepsis or failed endoscopic therapy. In a series of 65 cases of antenatally diagnosed PUV [11], 97% were managed by valve ablation alone. Conservative management is advocated for VUR in PUV as majority resolve with time. Heikkila, *et al*. [12] reported that almost half of 197 patients with PUV had resolution of VUR within 2 years after treatment.

The renal outcome of PUV is largely based on nadir creatinine; a recent study [13] showed that nadir level after treatment is reached by six months. The functional outcome is better for prenatally diagnosed PUV [14], and bladder function improves with longer follow-up.

PUV can present with antenatal hydronephrosis or postnatally with bladder outflow obstruction. Endoscopic valve ablation is the main modality of treatment and diversion is reserved if the former fails or is contraindicated. The prognosis of patients with mild disease and normal renal function is good, and in those with intermediate severity disease, postnatal therapy improves the outcome.

Acknowledgements: Dr Sreekumaran MI, who was part of the team in clinical management. Dr Biju George, for help in statistical analysis.
Contributors: TPJ: clinical management of patients, supervised the data collection and contributed to critical review of the article; VKG: helped in manuscript editing and clinical management; PRB: helped in manuscript editing and clinical management; KVSK: Data collection, data analysis and manuscript drafting.
Funding: None; *Competing interest*: None stated.

REFERENCES

1. Belloli G, Battaglino F, Mercurella A, Musi L, D'Agostino

D. Evolution of upper urinary tract and renal function in patients with posterior urethral valves. Pediatr Surg Int. 1996;11:339-43.
2. Farhat W, McLorie, Capolichio G, Khoury A, Bagli D, Merguerian PA. Outcomes of primary valve ablation versus urinary tract diversion in patients with posterior urethral valves. Urology. 2000;56:653-7.
3. Smith GH, Canning DA, Schulman SL, Snyder HM, Ducket JW. Long term outcome of posterior urethral valves treated with primary valve ablation and observation. J Urol. 1996;155:1730-4.
4. Heikkila J, Holmberg C, Kyllonen L, Rintala R, Taskinen S. Long-term risk of end stage renal disease in patients with posterior urethral valves. J Urol. 2011;186:2392-6.
5 Malin G, Tonks AM, Morris RK, Gardosi J, Kilby MD. Congenital lower urinary tract obstruction: A population-based epidemiological study. BJOG. 2012;119:1455-64.
6. Ruano R, Sananes N, Sangi-Haghpeykar H, Hernandez-Ruano S, Moog R, Becmeur F. Fetal intervention for severe lower urinary tract obstruction: A multicenter case-control study comparing fetal cystoscopy with vesicoamniotic shunting. Ultrasound Obstet Gynecol. 2015;45:452-8.
7. Samnakay N, Orford J, Barker A, Charles A, Newnham J, Moss T. Timing of morphologic and apoptotic changes in sheep fetal kidney in response to bladder outflow obstruction. J Pediatr Urol. 2006;2:216-24.
8. Thakkar D, Deshpande AV, Kennedy SE. Epidemiology and demography of recently diagnosed cases of posterior urethral valves. Pediatr Res. 2014;76:560-3.
9. Holmes N, Harrison MR, Baskin LS. Fetal surgery for posterior urethral valves. Long term postnatal outcomes. Pediatrics. 2001;108:E7.
10. Bhadoo D, Bajpai M, Abid A, Sukanya G, Agarwala S, Srinivas M, *et al*. Study of prognostic significance of antenatal ultrasonography and renin angiotensin system activation in predicting disease severity in posterior urethral valves. J Indian Assoc Pediatr Surg. 2015;20:63-7.
11. Sarhan O, Zaccaria I, Macher MA, Muller F, Vuillard E, Delezoide AL, *et al*. Long-term outcome of prenatally detected posterior urethral valves: Single center study of 65 cases managed by primary valve ablation. J Urol. 2008;179:18-9.
12. Heikkilä J, Rintala R, Taskinen S. Vesicoureteral reflux in conjunction with posterior urethral valves. J Urol. 2009;182:1555-60.
13. Deshpande AV, Alsaywid BS, Smith GH. Setting the speed limit: a pilot study of the rate of serum creatinine decrease after endoscopic valve ablation in neonates. J Urol. 2011;185:2497-500.
14. Kousidis G, Thomas DF, Morgan H, Haider N, Subramaniam R, Feather S. The long-term outcome of prenatally detected posterior urethral valves: a 10 to 23-year follow-up study. BJU Int. 2008;102:1020-4.