ORIGINAL ARTICLE

A CLINICAL STUDY OF POSTERIOR URETHRAL VALVE AND ITS IMPACT ON RENAL FUNCTION

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ABSTRACT: **OBJECTIVES:** The most common congenital anomaly is Posterior Urethral valve (PUV) and has as incidence of 1 in 8000 male births. It is the most common obstructive cause of end stage renal disease in children. Vesicoureteric reflux, recurrent UTI, voiding dysfunction and late onset renal failure are the long term major problems in these children. There are few long term outcome studies of children with PUV from India. These studies mainly concentrate on the surgical aspects. The study is aimed to assess the long term impact of PUV on renal function and the growth of these children. **METHODS:** The study was conducted at AJ hospital, Mangalore between July 2010-June 2011. Thirty children, with posterior urethral valve, five years or more post-surgery were included in the study. The details of children were obtained from records regarding age, presenting symptoms serum creatinine, presence of or absence of vesicoureteric reflux. Outcomes measured were stunting, renal failure (GFR, tubular functions) and bladder functions. Results were analysed. **RESULTS:** Thirty children were analysed. The age at presentation varied from antenatal detection to six years. About 46.6% of patients presented between 0-1 month, 36.6% between one month to one year, 16.8% between one to six years. The median age at presentation was three months. Primary surgery done in the neonatal period in 33% children. Of the 28 children who had antenatal ultrasound, 20 had normal USS and eight had antenatally detected hydronephrosis (28.6%). Five out of eight had associated oligohydramnios. All these five children had GFR <90 m/m/1.73m^2 at follow up. **CONCLUSION:** Poor bladder function was seen in one-third of patients. Interventions as and when needed on follow-up are important in the management of all children with posterior urethral valve. Comprehensive care should be the rule by a team comprising paediatrician, pediatric surgeon and pediatric nephrologists.

KEYWORDS: Renal function, posterior urethral valve, vesico uretric reflex.

INTRODUCTION: Posterior urethral valve disorder is an obstructive developmental anomaly in the urethra and genitor urinary system of male newborns. A posterior valve is an obstructing membrane in the posterior male urethra as a result of abnormal in vitro development.

Posterior urethral obstruction was first classified by H.H. Young in 1919. Which is as followed:

Type 1: Most common type due to anterior fusing of the plicae colliculi, mucosal extending from the bottom of the verumortanum distally along the prostatic and membranous urethra.

Type 2: Least common, vertical or longitudinal folds between the verumontanum and proximal prostatic urethra and bladder neck.

Type 3: Less common variant, a disc of tissue distal to verumontanum, also theorized to be developmental anomaly of congenital remnants in the bulbar urethra. Voiding cystourethrogram is specific for diagnosis, which is characterized by abrupt tapering of urethral caliber near the

verumontanum. Vesicourethral reflux is seen in over 50% of cases. Diagnosis can also be made by cystoscopy.

It is the most common cause of bladder outlet obstruction in male newborns. The disorder varies in degree with mild cases to severe cases. The mild cases are follow conservatively the more severe cases can have renal and respiratory failure of lung and kidney un development as a result of low amniotic fluid volumes, requiring intensive care and close monitoring. Incidence of posterior urethral valve disorders is 1 in 8,000 birth.

The endoscopic treatment for severe forms of posterior urethral valve are:

1. Vesicostomy followed by valve ablation
2. Pyelostomy followed by valve ablation
3. Primary valve ablation

METHODS: The study was conducted at AJ hospital, Mangalore between July 2010 - June 2011.

Thirty children, with posterior urethral valve, five years or more post-surgery were included in the study.

The details of children were obtained from records regarding age, presenting symptoms serum creatinine, presence of or absence of vesicoureteric reflux. On follow-up, they were assessed clinically. Weight and height were measured using standardized procedures. Biochemical analysis and ultrasound abdomen were done. Outcomes measured were stunting, renal failure (GFR, tubular functions) and bladder functions.

Results were analysed with mean, chi-square test and Mann-Whitney 'V' tests. Univariate analysis was done to assess risk factors for decline in GFR.

DISCUSSION: In the recent decades, the immediate outcome of boys with PUV has improved continuously with the development of early diagnostic and treatment modalities. However, there is a growing concern over the long term outcome of these children as 24 to 45% of them develop renal failure in childhood or adolescence.

Unfavorable prognostic indicators include antenatal presentation before 24 weeks of intrauterine life, renal dysplasia, poor corticomedullary differentiation on ultrasonography, B/L vesicoureteric reflux (VUR) and persistence of high serum creatinine.

Analysis of the clinical presentation of 30 children with PUV showed that the most common symptom at presentation was poor urinary stream followed by recurrent UTI, poor weight gain, renal failure and abdominal mass. Median age at presentation was 3 months. In a study by Parkhouseet. Al. one third of patients were detected between 0-1 month, one- third between one month and one year and one third between one and six years.

Eighty percent of the study population had undergone surgery in infancy. By univariate, analysis, children whose surgery was beyond 28 days had statistically significant risk of poor glomerular function on follow up. Hydronephrosis was detected antenatally in 28.6%. If the amniotic fluid volume is low, the outcome is poor with low GFR. Those with hydronephrosis and oligohydramnios had a poorer outcome than those without oligohydramnios.

About 55.2% children had VUR at diagnosis and VUR was bilateral in 41.4%. Study by parkhases et al.[4] reported the occurrence of VUR to be 25%.[4] In a study by Roth et al. unilateral VUR was present in 30% and bilateral VUR in 50%.[5] In a review from CMC Vellore VUR was prevent in the new born period in 30%.[2]

Five years after surgery, 50% children were symptomatic. The major symptoms at follow up were increases, dribbling and polyuria. But urodynamic studies could not be done due to lack of facilities.

In a study by Lal et al.[6] 35% had symptomatic voiding dysfunction, the most common symptom being nocturnal increases with diural urgency and frequency on long term follow up.[6] in the study by connor et al. 19% patients had urinary in continence on follow up.[7] These symptoms are due to the poor concentrating ability of the renal tubules along with poor bladder compliance. GFR was decreased < 90 ml/m/1.73m^2 in 86.7%, < 60ml/m/1.73m^2 in 33.3% and severe reduction of GFR <30ml/m/1.73m^2 in 20% patients. The study by parkhouse et al. reported poor outcome in one third of patients.[4] In a follow up study of 46 children with PUV with a mean follow up of 12.5 years, E ylinen et al. reported that 30% had a GFR < 60 ml/m/1.73m^2.[8]

About 30% of children in our study group had growth failure in the form of stunting. Those with GFR <60 ml/m/1.73m^2 had a greater degree of growth failure. In a study by Tejaniet al with a mean follow up of nine years, growth failure was present in 40% of patients.[9] In the long term follow up study from India by A. M. Gangapodhyaya height was below 50thcentile in 52% children.[1]

The severity of metabolic acidosis increased with greater decline in GFR. Statistically significant risk factors in this study for decline in GFR are oligamnios and surgery after the neonatal period. Ansari et al. also had similar observations. They have reported that children with PUV preventing after two years have higher risk of developing chronic renal insufficiency on long term follow up.[3]

The presence of vescicoureteral reflux was not a risk factor for decline in GFR in our study. This is in contrast to the previous studies by Elisa et al.[8] and Ansari et al.[3]

Antenatal detection, counselling of the couple regarding the poor outcome if there is oligohydramnios, early fulguration before 28 days assessment of GFR before surgery, assessment of yearly GFR, renal growth, tubular functions, bladder functions, optimization of reno protective measures and surgical interventions as and when needed on follow-up are important in the management of all children with posterior urethral valve.

Comprehensive care should be the rule by a team comprising paediatrician, paediatrics surgeon and pediatric nephrologists for prompt diagnosis and management of upper and lower urinary tract of their children. This will go a long way in reno protection and delaying the occurrence of kidney failure in children with corrected PUV. It also helps in early planning of renal replacement therapies in children with progressive renal insufficiency.

RESULTS: The study was conducted at AJ hospital, Mangalore between July 2010-June 2011. Thirty children were analysed.

Sl. No	Age	Percentage
1	0 to 1 months	46.6%
2	One month to one year	36.6%
3	One to six years	16.8%

Table 1: Age of the patient

The age at presentation varied from antenatal detection to six years. The median age at presentation was three months. Primary surgery done in the neonatal period in 33% children.

Of the 28 children who had antenatal ultrasound, 20 had normal USS and eight had antenatally detected hydronephrosis (28.6%). Five out of eight had associated oligohydramnios. All these five children had GFR <90 m/m/1.73m^2 at follow up.

About 45% of patients have no VUR at diagnosis while 13.8% had unilateral VUR and 41.4% had bilateral VUR. Poor urinary stream was the commonest presentation (83%) followed by recurrent 077 (70%) others symptoms were poor weight gain, renal failure and abdominal mass.

Elevated serum creatinine was present at diagnosis in 63% of patients.37% of them were oliguric and 57.9% had poor weight gain in infancy.

Sl. No	Symptoms	Percentage
1	Symptomatic	50
2	Enuresis	47
3	Dribbling	43
4	Polyuria	40
5	Muscle cramps	33
6	Recurrent UTI	23
7	Bone pain	13

Table 2: Symptoms at follow-up

Risk factors	GFR 760 (n=20)	GFR <60 (n=10)
Surgery beyond neonatal period	10	9
Presence of antenatal hydronephrosis	7	1
Oligamnios	1	4
S.creatinine at presentation>0.8 mg/dl	16	10
presence of VUR	9	7

Table 3: Risk factors for decline in GFR (univariate analysis)

The age of the study population at follow up ranged from 5-16 years with the mean of 7.78 years.

Using the WHO definition of stunting, growth failure was assessed. Stunting is defined by the WHO as a height for age more than a standard deviation of 2 below the median value of the reference population. Nine out of 30 patients (30%) has growth failure. Of the Six patients with GFR less than 30 ml/m/1.73m^2, A patients (66.7%) had stunting.

Using the NCHS reference standards for height and applying water lows classification, 43.4% had second degree stunting and 20% had third degree stunting.

To study the relation between GFR and growth failure, divided into two groups- those with GFR< 60ml/ml/1.73m^2 and those with GFR>60 ml/ml/1.73m^2. Correlation was significant between low GFR and degree of stunting.

About 40% of children had polyuria. Venous bicarbonate levels were done in 26 patients. Of this, 15 patients had a bicarbonate <22 meg/L and 11 patients had a bicarbonate level > 22 meg/L.

To study the relation between the presence of acidosis and GFR, the patients were divided into three groups: GFR < 30 ml/ m/ 1/ 73m^2 GFR 30-60 ml/m/ 1.73m^2 and GFR > 60 ml/m/ 1.73m^2. In patients with GFR <30 ml/m/ 1.73m^2, the mean venous bicarbonate was 18.67 meg/l (SD of 1.5), in those with GFR 30-60 l/m/1.73m^2, the mean various bicarbonate was 20.50 (SD of 1.2) and in patients with GFR > 60 ml/m/1.73m^2, the mean venous bicarbonate level <22 meg/l (90%). There was a statistically significant relation between the severity of acidosis and stage of CKD 88% (n=22) of the patients with GFR > 30 ml/m/1.73m^2 in an study had urine specific gravity <1.010.

History of dribbling was present in 43% of children. USS abdomen should significant residual urine in 30%. There was residual hydronephrosis in 74% patients-bilateral in 55.5% and unilateral in 18.5%. All 6 patients with GFR < 30 ml/m/1/73m^2 had bilateral gross hydronephrosis and majority has significant residual urine. Those patients with a normal urinary tract on ultrasound abdomen at follow up had a GFR above 60 ml/m/1.73m^2.

Univariate analysis was done to assess the risk factors for decline in GFR. Statistically significant risk factors included oligamnios and surgery after the neonatal period. Antenatal detection, presence of vescicourethral reflux and initial serum creatinine were not statistically significant.

CONCLUSION: This study was done to assess the growth and renal function of children who had completed 5 years after surgery for posterior urethral valve. Outcomes measured were stunting, renal failure (GFR, tubular functions) and bladder functions.

Even after surgery after five years fifty percent of children were symptomatic. Stunting was present in one–third of children. A low GFR was associated with growth failure. Poor bladder function was seen in one-third of patients.

Interventions as and when needed on follow-up are important in the management of all children with posterior urethral valve. Comprehensive care should be the rule by a team comprising paediatrician, pediatric surgeon and pediatric nephrologists.

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