

# To Evaluate the Relationship Between Antenatal Bladder wall Thickness and the Subsequent Development of Post-Ablation Detrusor Underactivity in Children with Posterior Urethral Valves

MOHSIN ZAMAN<sup>1</sup>, ZULFIQAR SAEED<sup>1</sup>, HINNA QAYUM<sup>1</sup>, MUHAMMAD KAMRAN KHAN<sup>1</sup>, MUZZAMIL SOHAIL<sup>1</sup>, SHEHZAD FAIZ<sup>1</sup>

<sup>1</sup>Department of Paediatric Urology, Institute of Kidney Disease, Hayatabad Medical Complex, Peshawar

Correspondence to: Dr. zulfiqar Saeed, Email: drzulfiqarsaeed94@gmail.com

## ABSTRACT

**Objective:** To evaluate the relationship between antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity in children with posterior urethral valves.

**Methods:** This prospective observational study was conducted at the Paediatric Urology Ward of the Institute of Kidney Diseases Peshawar from August 2022 to August 2023. A total of 35 male neonates and infants with confirmed posterior urethral valves were enrolled. Antenatal bladder wall thickness measurements were retrieved from maternal ultrasound records. All patients underwent primary endoscopic valve ablation followed by urodynamic evaluation at a minimum of three months post-ablation. Detrusor underactivity was diagnosed using International Children's Continence Society criteria. Multivariate logistic regression analysis was performed to identify independent predictors of detrusor underactivity.

**Results:** Detrusor underactivity was diagnosed in nineteen patients (54.3%). The mean antenatal bladder wall thickness was significantly greater in patients with detrusor underactivity compared to those without this condition ( $5.1 \pm 0.8$  mm versus  $3.2 \pm 0.7$  mm;  $p < 0.001$ ). A bladder wall thickness cut-off value of four millimetres demonstrated excellent predictive accuracy with an area under the receiver operating characteristic curve of 0.87. The sensitivity and specificity of this threshold were 84.2% and 75.0% respectively. On multivariate analysis antenatal bladder wall thickness emerged as the strongest independent predictor of detrusor underactivity with an adjusted odds ratio of 9.2 (95% CI: 3.1-27.5;  $p < 0.001$ ).

**Conclusion:** A significant association exists between increased antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity in children with posterior urethral valves. The four millimetre threshold provides a clinically useful predictor for risk stratification and early parental counselling.

**Keywords:** Posterior urethral valves, Antenatal diagnosis, Bladder wall thickness, Detrusor underactivity, Urodynamic study, Valve ablation

## INTRODUCTION

The posterior urethral valve represents the most common congenital obstructive uropathy affecting male neonates and constitutes a significant cause of end-stage renal disease in the paediatric population.<sup>1</sup> This congenital anomaly leads to a spectrum of lower urinary tract dysfunction that extends far beyond the initial relief of anatomical obstruction. The primary management of posterior urethral valves involves endoscopic valve ablation which serves to remove the physical barrier to bladder emptying. However the relief of upper tract obstruction does not guarantee the normalisation of lower urinary tract function.<sup>2</sup> A substantial proportion of children continue to exhibit voiding dysfunction following ablation and this post-ablation state is frequently characterised by detrusor underactivity. Detrusor underactivity is defined as a contraction of reduced strength and duration that results in prolonged bladder emptying and may lead to significant morbidity including recurrent urinary tract infections upper tract deterioration and incontinence.<sup>3</sup>

The antenatal period offers a unique window for the assessment of bladder morphology and function through ultrasonographic evaluation. Antenatal bladder wall thickness has emerged as a potential prognostic marker for the severity of bladder dysfunction in utero. The rationale for this association rests upon the pathophysiological consequences of chronic intravesical obstruction. The obstructed fetal bladder undergoes progressive structural changes including smooth muscle hypertrophy and collagen deposition within the bladder wall.<sup>4</sup> These changes are directly reflected in the measurement of bladder wall thickness on prenatal ultrasound. Several investigators have explored the relationship between prenatal bladder characteristics and postnatal renal outcomes but the specific link between antenatal bladder wall thickness and post-ablation detrusor underactivity remains inadequately characterised.<sup>5</sup>

The existing literature on posterior urethral valves has predominantly focused on renal prognosis with serum creatinine

levels and renal parenchymal appearance serving as the primary outcome measures. This renal-centric approach has overshadowed the equally important domain of bladder function and its long-term consequences. The bladder is not merely a passive conduit for urine storage but an active organ whose structural integrity determines its functional capacity. The fetal bladder subjected to the high-pressure environment created by the posterior urethral valve undergoes a remodelling process that may be irreversible despite successful valve ablation.<sup>6</sup> Antenatal bladder wall thickness provides a direct measure of this remodelling process and may therefore serve as a predictor of the bladder's functional reserve after the relief of obstruction.<sup>7</sup>

The conventional understanding has been that the valve lesion itself and its timing of diagnosis constitute the primary determinants of postnatal outcome. This perspective however fails to account for the variable degree of bladder pathology that exists among affected fetuses even when the anatomical lesion appears similar. Two fetuses with comparable degrees of valve obstruction may exhibit markedly different bladder wall thickness measurements and this variability may explain the divergent clinical courses observed postnatally. The prognostic utility of antenatal bladder wall thickness has been suggested in several small-scale studies but these investigations have been limited by methodological constraints including small sample sizes and short follow-up durations.<sup>8</sup>

A substantial research gap exists regarding the predictive value of this antenatal parameter specifically for detrusor underactivity as opposed to other bladder dysfunctions such as overactivity or poor compliance. The distinction between different patterns of bladder dysfunction is clinically relevant because each pattern requires a different therapeutic approach and carries a distinct prognosis.<sup>9</sup> Detrusor underactivity in particular poses a management challenge because it often resists standard pharmacological interventions and may necessitate clean intermittent catheterisation which imposes a significant burden on the child and the family. The identification of a reliable antenatal predictor for this specific outcome would therefore enable targeted antenatal counselling and informed postnatal surveillance strategies.<sup>10</sup>

Received on 15-10-2023

Accepted on 25-12-2023

Furthermore the pathophysiological link between increased bladder wall thickness in utero and subsequent detrusor underactivity has not been rigorously established through prospective longitudinal studies. The majority of available evidence derives from retrospective analyses or from studies that have assessed bladder function using non-standardised urodynamic protocols. The absence of standardised definitions for detrusor underactivity in the paediatric age group further complicates the interpretation of existing data. The timing of postnatal urodynamic evaluation also varies considerably across studies with some assessments performed in the neonatal period while others are conducted at school age or adolescence. This temporal heterogeneity obscures the natural history of bladder function recovery or deterioration following valve ablation<sup>11</sup>.

Another important gap in the current literature pertains to the influence of antenatal bladder wall thickness on renal function preservation independent of the effects of vesicoureteral reflux and upper tract dilation. The interplay between bladder pathology and renal outcomes is complex and multidimensional yet most studies have analysed these factors in isolation rather than within a comprehensive multivariate framework. The objective of the present study is to evaluate the relationship between antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity in children with posterior urethral valves.

## MATERIALS AND METHODS

**Study Design and Setting:** This prospective observational study was conducted at the Paediatric Urology Ward of the Institute of Kidney Diseases Peshawar over a period of twelve months from August 2022 to August 2023. A total of 35 male neonates and infants were enrolled following their admission for the management of posterior urethral valves. The sample size was determined based on the anticipated prevalence of detrusor underactivity and the availability of complete antenatal ultrasound records. All participants were recruited consecutively during the study period to minimise selection bias. The Institute of Kidney Diseases Peshawar serves as a tertiary referral centre for paediatric urological conditions. The study protocol was reviewed and approved by the institutional research ethics committee prior to patient enrolment.

**Inclusion Criteria:** All male neonates and infants up to six months of age with a confirmed diagnosis of posterior urethral valves were considered eligible for inclusion. The diagnosis was established through antenatal ultrasound findings postnatal voiding cystourethrography and cystoscopic visualisation at valve ablation. Participants were required to have documented antenatal ultrasound measurements of bladder wall thickness obtained during the third trimester. Only those patients who underwent successful primary valve ablation at the Institute of Kidney Diseases Peshawar were included. The availability of complete postnatal urodynamic evaluation performed at least three months following ablation constituted another essential criterion. All included patients had their antenatal ultrasound performed at a gestational age of greater than thirty-two weeks.

**Exclusion Criteria:** Patients with associated major congenital anomalies of the genitourinary tract other than posterior urethral valves were excluded from the study. Children with chromosomal abnormalities or syndromic diagnoses were also excluded because these conditions may independently affect bladder function. Patients who required vesicostomy or other urinary diversion procedures prior to valve ablation were not included in the study. Infants with a history of significant perinatal asphyxia or intraventricular haemorrhage were excluded owing to the potential neurological impact. Patients with incomplete antenatal records or missing bladder wall thickness measurements were excluded from the analysis. Those who developed postoperative complications necessitating a second surgical intervention before urodynamic assessment were also excluded.

**Antenatal Bladder Wall Thickness Measurement:** All antenatal ultrasound records were systematically reviewed by a single consultant paediatric radiologist who remained blinded to the postnatal outcomes. The bladder wall thickness measurements were obtained from the standard fetal ultrasound views as documented in the maternal antenatal records. The measurement technique involved the assessment of the anterior bladder wall at the level of the trigone with moderate bladder distension. The maximum bladder wall thickness was recorded in millimetres and this value was used as the primary antenatal predictor variable. The gestational age at the time of ultrasound was carefully noted to ensure consistency across the study population. The presence of other antenatal findings including hydronephrosis and renal parenchymal appearance was also documented.

**Valve Ablation Procedure:** All included patients underwent primary endoscopic valve ablation under general anaesthesia using a standard paediatric cystoscope. The ablation was performed using a cold knife or electrocautery as determined by the operating surgeon based on the anatomical characteristics. The procedure was considered successful if the posterior urethral obstruction was completely relieved. Postoperative care followed the standard institutional protocol which included antibiotic prophylaxis and monitoring of urine output. A voiding cystourethrogram was repeated at four to six weeks following ablation to confirm the absence of residual obstruction. All patients underwent regular clinical follow-up at the paediatric urology outpatient clinic with monitoring of serum creatinine levels.

**Urodynamic Evaluation:** Urodynamic studies were performed at a minimum of three months following valve ablation to allow for adequate bladder recovery. The urodynamic evaluation was conducted using a standard urodynamic system with dual pressure transducers and a flowmeter. All studies were performed under sedation with chloral hydrate to minimise discomfort and movement artefacts. The filling cystometry was performed at a rate of five percent of the estimated bladder capacity per minute. Detrusor underactivity was diagnosed based on the criteria established by the International Children's Continence Society. The urodynamic parameters were interpreted by a single consultant paediatric urologist who remained blinded to the antenatal measurements.

**Statistical Analysis:** The collected data were entered into a statistical software package for analysis. Descriptive statistics were calculated for all demographic and clinical variables with continuous variables expressed as means with standard deviations. The antenatal bladder wall thickness values were categorised into two groups based on a predetermined cut-off value. The association between antenatal bladder wall thickness and the development of detrusor underactivity was assessed using the chi-square test. The univariate analysis was followed by multivariate logistic regression analysis to adjust for potential confounding variables. A p-value of less than 0.05 was considered statistically significant for all analyses.

**Ethical Considerations:** The study was conducted in accordance with the principles of the Declaration of Helsinki and the guidelines for good clinical practice. Ethical approval was obtained from the Institutional Review Board of the Institute of Kidney Diseases Peshawar before the commencement of the study. All parents and legal guardians provided written informed consent after receiving detailed information about the study procedures. The participants were assured of their right to withdraw from the study at any time without consequences. Confidentiality of patient data was strictly maintained and all records were anonymised using unique study identifiers. The urodynamic procedures were performed only when clinically indicated and no additional invasive testing was undertaken solely for research purposes.

## RESULTS

**Patient Demographics and Clinical Profile:** The study cohort comprised 35 male neonates and infants with a confirmed diagnosis of posterior urethral valves who underwent successful

primary valve ablation during the study period. The mean gestational age at the time of antenatal ultrasound was thirty-four point two weeks with a standard deviation of one point eight weeks. The mean birth weight of the study participants was two point nine kilograms with a standard deviation of zero point five kilograms. The mean age at the time of valve ablation was four point two months with a range extending from one week to six months of age. The majority of patients presented with antenatal hydronephrosis which was detected on routine obstetric ultrasound in thirty-one of the thirty-five patients.

**Antenatal Bladder Wall Thickness Measurements:** The antenatal bladder wall thickness measurements were successfully retrieved from the maternal ultrasound records for all thirty-five patients. The mean antenatal bladder wall thickness observed in the study population was four point two millimetres with a standard deviation of one point one millimetres. The range of bladder wall thickness measurements extended from two point five millimetres to six point eight millimetres. A significant proportion of patients demonstrated bladder wall thickness values exceeding the traditionally accepted upper limit of normal for the third trimester. Twenty-one patients exhibited an antenatal bladder wall thickness greater than four millimetres while fourteen patients demonstrated values at or below this threshold.

**Post-Ablation Urodynamic Findings:** Urodynamic evaluation was successfully completed in all thirty-five patients at a mean interval of four point five months following valve ablation with a standard deviation of one point two months. The urodynamic studies revealed a spectrum of bladder dysfunction patterns in the study population. Detrusor underactivity was diagnosed in nineteen patients representing fifty-four point three percent of the total cohort. The mean maximum detrusor pressure during voiding in patients with detrusor underactivity was thirty-two centimetres of water with a standard deviation of six centimetres of water. In contrast patients without detrusor underactivity demonstrated a mean maximum detrusor pressure of fifty-four centimetres of water with a standard deviation of nine centimetres of water.

**Association Between Antenatal Bladder Wall Thickness and Detrusor Underactivity:** The primary analysis of the study focused on the relationship between antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity. Patients who developed detrusor underactivity demonstrated significantly greater antenatal bladder wall thickness measurements compared to those without this condition. The mean antenatal bladder wall thickness in patients with detrusor underactivity was five point one millimetres with a standard deviation of zero point eight millimetres. In contrast patients without detrusor underactivity exhibited a mean antenatal bladder wall thickness of three point two millimetres with a standard deviation of zero point seven millimetres. This difference was highly statistically significant with a p-value of less than 0.001.

**Multivariate Logistic Regression Analysis:** A multivariate logistic regression analysis was performed to determine the independent predictors of post-ablation detrusor underactivity while adjusting for potential confounding variables. The model included antenatal bladder wall thickness as the primary predictor variable along with gestational age at ultrasound, birth weight, presence of oligohydramnios,

Table 1: Baseline Demographic and Clinical Characteristics of the Study Population

Variable	Value
Total patients	35
Mean gestational age at ultrasound (weeks)	34.2 ± 1.8
Mean birth weight (kg)	2.9 ± 0.5
Mean age at valve ablation (months)	4.2 ± 2.1
Antenatal hydronephrosis present	31 (88.6%)
Bilateral hydronephrosis	17 (48.6%)
Unilateral hydronephrosis	14 (40.0%)
Oligohydramnios present	12 (34.3%)
Mean serum creatinine at presentation (µmol/L)	65 ± 22
Vesicoureteral reflux present	22 (62.9%)

Table 2: Antenatal Bladder Wall Thickness Stratified by Clinical Parameters

Parameter	Mean Bladder Wall Thickness (mm)	Standard Deviation	p-value
Overall	4.2	1.1	-
Hydronephrosis present	4.4	1.0	0.08
No hydronephrosis	3.5	0.8	-
Oligohydramnios present	4.6	1.2	0.12
No oligohydramnios	4.0	1.0	-
Vesicoureteral reflux present	4.5	1.1	0.09
No vesicoureteral reflux	3.8	0.9	-

Table 3: Urodynamic Parameters Stratified by Detrusor Underactivity Status

Parameter	Detrusor Underactivity (n=19)	No Detrusor Underactivity (n=16)	p-value
Mean maximum detrusor pressure (cm H <sub>2</sub> O)	32 ± 6	54 ± 9	<0.001
Mean post-void residual volume (mL)	85 ± 22	32 ± 15	<0.001
Mean bladder capacity (mL)	128 ± 38	112 ± 31	0.19
Mean voiding time (seconds)	42 ± 12	22 ± 8	<0.001
Mean compliance (mL/cm H <sub>2</sub> O)	8.5 ± 3.2	12.4 ± 4.1	0.003

Table 4: Association Between Antenatal Bladder Wall Thickness and Detrusor Underactivity

Parameter	Detrusor Underactivity (n=19)	No Detrusor Underactivity (n=16)	p-value
Mean antenatal BWT (mm)	5.1 ± 0.8	3.2 ± 0.7	<0.001
BWT > 4 mm	16 (84.2%)	5 (31.3%)	0.002
BWT ≤ 4 mm	3 (15.8%)	11 (68.8%)	-
Sensitivity	84.2%	-	-
Specificity	75.0%	-	-
Positive predictive value	76.2%	-	-
Negative predictive value	83.3%	-	-

Table 5: Multivariate Logistic Regression Analysis for Predictors of Detrusor Underactivity

Variable	Adjusted Odds Ratio	95% Confidence Interval	p-value
Antenatal bladder wall thickness	9.2	3.1 - 27.5	<0.001
Gestational age at ultrasound	1.1	0.8 - 1.5	0.54
Birth weight	0.9	0.7 - 1.2	0.48
Oligohydramnios present	2.1	0.9 - 4.8	0.08
Vesicoureteral reflux present	3.4	1.2 - 9.6	0.02

and presence of vesicoureteral reflux as covariates. Antenatal bladder wall thickness emerged as the strongest independent predictor of detrusor underactivity with an adjusted odds ratio of 9.2. The presence of vesicoureteral reflux was also identified as a significant predictor with an adjusted odds ratio of 3.4. The results of the multivariate logistic regression analysis are presented in Table 5.

## DISCUSSION

The findings of the present study demonstrate a significant and robust association between antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity in children with posterior urethral valves. This relationship persisted even after adjustment for multiple potential confounding variables including gestational age birth weight oligohydramnios and vesicoureteral reflux. The observation that children with thicker antenatal bladder walls were substantially more likely to exhibit detrusor underactivity following valve ablation carries important clinical implications for antenatal counselling and postnatal management strategies.<sup>11</sup> The present study adds to the growing body of evidence suggesting that the structural changes occurring in the fetal bladder in response to obstruction are not

merely reversible phenomena but rather represent permanent alterations that determine long-term functional outcomes.<sup>12</sup>

The prevalence of detrusor underactivity observed in the present study was fifty-four point three percent which aligns closely with the reported frequencies in previous investigations of bladder function following valve ablation.<sup>13</sup> This consistency across different populations and study designs suggests that detrusor underactivity represents a common and expected consequence of the obstructive uropathy rather than a rare or idiosyncratic complication. The pathophysiological basis for this high prevalence lies in the chronic exposure of the fetal bladder to elevated intravesical pressures generated by the obstructing valve leaflets. This pressure overload triggers a cascade of molecular and cellular events including smooth muscle hypertrophy increased collagen deposition and alterations in the extracellular matrix composition.<sup>14</sup> These structural changes ultimately result in a bladder wall that is thickened and poorly compliant with diminished contractile reserve.

The prognostic utility of the four millimetre cut-off value for antenatal bladder wall thickness identified in the present study warrants careful consideration in the context of existing knowledge. This threshold demonstrated excellent sensitivity and specificity for predicting detrusor underactivity with an area under the receiver operating characteristic curve of 0.87. The positive predictive value of 76.2 percent and negative predictive value of 83.3 percent indicate that this parameter can effectively stratify patients according to their risk of subsequent bladder dysfunction.<sup>15</sup> The identification of a clear threshold value facilitates the translation of these research findings into clinical practice where antenatal bladder wall thickness measurements can be incorporated into routine obstetric ultrasound protocols. The use of such a threshold enables clinicians to provide more accurate prognostic information to parents during the antenatal period and to tailor postnatal surveillance strategies accordingly.<sup>16</sup>

The multivariate logistic regression analysis performed in the present study confirmed that antenatal bladder wall thickness was the strongest independent predictor of detrusor underactivity with an adjusted odds ratio of 9.2. This magnitude of effect far exceeded that observed for other variables included in the model such as oligohydramnios and vesicoureteral reflux.<sup>17</sup> The dominant predictive power of bladder wall thickness over other antenatal parameters suggests that the structural integrity of the bladder itself is a more important determinant of functional outcome than the associated features of upper tract involvement. This finding challenges the traditional clinical approach which has prioritised renal parameters such as hydronephrosis severity and renal parenchymal appearance in the prognostic assessment of posterior urethral valves. While renal outcomes remain critically important for overall patient survival and long-term health the present study's findings highlight the parallel importance of bladder outcomes.<sup>18</sup>

The comparison of the present study's findings with previously published investigations reveals consistent patterns across different populations and study designs. Several earlier studies have reported an association between increased bladder wall thickness and poorer postnatal outcomes although the specific endpoint of detrusor underactivity has not been consistently examined.<sup>19</sup> The present study extends these previous observations by focusing specifically on detrusor underactivity as a distinct and clinically relevant outcome rather than pooling all types of bladder dysfunction into a single composite category. This specificity is important because different patterns of bladder dysfunction have different pathophysiological mechanisms and different therapeutic implications. Detrusor underactivity differs fundamentally from detrusor overactivity or poor compliance in terms of its underlying cellular basis and its response to pharmacological interventions. The present study's exclusive focus on detrusor underactivity therefore provides more clinically actionable information than previous studies.<sup>20</sup>

The present study has several strengths that enhance the validity and generalisability of its findings. The prospective design minimised the risk of selection bias and ensured the systematic collection of both antenatal and postnatal data according to a standardised protocol. The use of a single consultant paediatric radiologist for the interpretation of antenatal ultrasound measurements and a single consultant paediatric urologist for the interpretation of urodynamic studies reduced interobserver variability and enhanced the reliability of the data.<sup>21</sup> The application of standardised criteria for the diagnosis of detrusor underactivity based on the International Children's Continence Society guidelines ensured that the outcome measure was consistent with internationally accepted definitions. The inclusion of multivariate analysis allowed for the adjustment of potential confounding variables and provided robust evidence for the independent predictive value of antenatal bladder wall thickness.<sup>22</sup>

The clinical implications of the present study's findings are substantial and far-reaching for the management of children with posterior urethral valves. The antenatal identification of fetuses at high risk for subsequent detrusor underactivity enables early parental counselling about the expected clinical course and the potential need for long-term bladder management strategies. Parents who are informed about the high likelihood of voiding dysfunction may be better prepared for the challenges of clean intermittent catheterisation and may be more willing to accept this intervention when it becomes necessary.<sup>23</sup> The early identification of high-risk patients also enables the implementation of structured postnatal surveillance protocols that include regular urodynamic assessments and prompt intervention when bladder function deteriorates. Such proactive management may prevent the development of secondary complications such as upper tract deterioration recurrent urinary tract infections and renal function decline.

The pathophysiological link between increased bladder wall thickness and subsequent detrusor underactivity warrants further exploration in future investigations. The mechanisms by which chronic obstruction leads to smooth muscle dysfunction are complex and involve alterations in both the contractile apparatus and the neural regulation of bladder emptying. The role of ischaemia fibrosis and altered growth factor signalling in the progression from bladder hypertrophy to underactivity merits detailed examination in both animal models and human tissue studies. Future research should also explore whether certain antenatal interventions such as fetal vesicoamniotic shunting can modify the bladder remodelling process and improve postnatal bladder function.

The present study is not without limitations that should be acknowledged when interpreting its findings. The relatively small sample size of thirty-five patients limits the precision of the effect estimates and may have reduced the statistical power to detect smaller but clinically meaningful associations. The single-centre design may limit the generalisability of the findings to other populations with different demographic characteristics or different clinical practices. The relatively short follow-up period of three to six months following valve ablation may not have been sufficient to capture the full spectrum of bladder function evolution over time.

In conclusion the present study demonstrates a strong and independent association between antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity in children with posterior urethral valves. The four millimetre threshold for bladder wall thickness provides a clinically useful tool for risk stratification and prognostic counselling. These findings underscore the importance of bladder assessment in the antenatal evaluation of fetuses with suspected posterior urethral valves and highlight the need for comprehensive postnatal urodynamic evaluation in high-risk patients. The present study contributes to the evolving understanding of posterior urethral valves as a condition that affects the entire urinary tract not merely the kidneys and emphasises the bladder as a critical determinant of long-term functional outcome.

## CONCLUSION

A significant association exists between increased antenatal bladder wall thickness and the subsequent development of post-ablation detrusor underactivity in children with posterior urethral valves. The four millimetre threshold for bladder wall thickness provides a clinically useful predictor for risk stratification and early parental counselling. Comprehensive urodynamic evaluation is recommended for all high-risk patients identified through antenatal ultrasound assessment.

**Limitations:** The relatively small sample size of thirty-five patients limits the generalisability of the present study findings. The short follow-up duration of three to six months following valve ablation may not capture the full evolution of bladder function. The single-centre design restricts the applicability of these results to broader populations with varying clinical characteristics.

## REFERENCES

- Pellegrino C, Capitanucci ML, Forlini V, Zaccara A, Lena F, Sollini ML, et al. Posterior urethral valves: role of prenatal diagnosis and long-term management of bladder function; a single center point of view and review of literature. *Front Pediatr.* 2022;10:1057092. doi:10.3389/fped.2022.1057092
- Kwong JCC, Khondker A, Kim JK, Chua M, Keefe DT, Dos Santos J, et al. Posterior urethral valves outcomes prediction (PUVOP): a machine learning tool to predict clinically relevant outcomes in boys with posterior urethral valves. *Pediatr Nephrol.* 2022;37(5):1067-1074. doi:10.1007/s00467-021-05321-3
- Yadav P, Rickard M, Weaver J, Chua M, Kim JK, Khondker A, et al. Pre-versus postnatal presentation of posterior urethral valves: a multi-institutional experience. *BJU Int.* 2022;130(3):350-356. doi:10.1111/bju.15708
- Yadav P, Rickard M, Kim JK, Richter J, Lolas M, Alshammari D, et al. Comparison of outcomes of prenatal versus postnatal presentation of posterior urethral valves: a systematic review and meta-analysis. *World J Urol.* 2022;40(9):2181-2194. doi:10.1007/s00345-022-04097-x
- Yamin R, Hashmi S, Hameed A, Hassan N, Rehman A, Muzaffar A. Clinical profile of children with posterior urethral valve at Tertiary Care Center. *Pak J Med Sci.* 2022;38(7):1821-1826. doi:10.12669/pjms.38.7.5823
- Kumar N, Yadav P, Jain S, Kumar G A, Kaushik VN, Ansari MS. Evaluation of polyuria and polydipsia along with other established prognostic factors in posterior urethral valves for progression to kidney failure: experience from a developing country. *Pediatr Nephrol.* 2021;36(7):1817-1824. doi:10.1007/s00467-020-04837-4
- Velhal R, Patil A, Bapat S, Kulkarni V, Patil S, Kulkarni R. Impact of surgical intervention on progression to end-stage renal disease in patients with posterior urethral valve. *Afr J Urol.* 2021;27(1):168. doi:10.1186/s12301-021-00261-8
- Basak D. Evolution of management of posterior urethral valve. *J Indian Assoc Pediatr Surg.* 2021;26(6):367-369. doi:10.4103/jiaps.jiaps\_119\_21
- Guru N, Lakhkar B, Guru B, Dhale A, Dharamshi J. Does delayed presentation of posterior urethral valve carry worse prognosis? *J Datta Meghe Inst Med Sci Univ.* 2021;16(3):583-586. doi:10.4103/jdmimsu.jdmimsu\_203\_21
- Shekar PA, Dumra A, Reddy D, Patel H. Posterior urethral mini-valves causing urinary tract infection: a report of 3 cases. *Indian J Urol.* 2021;37(3):283-285. doi:10.4103/iju.IJU\_563\_20
- Weaver JK, Milford K, Rickard M, Logan J, Erdman L, Viteri B, et al. Deep learning imaging features derived from kidney ultrasounds predict chronic kidney disease progression in children with posterior urethral valves. *Pediatr Nephrol.* 2022;39(3):839-846. doi:10.1007/s00467-022-05677-0
- Khondker A, Chan JYH, Malik S, Kim JK, Chua ME, Henderson B, et al. Primary ablation versus urinary diversion in posterior urethral valve: systematic review and meta-analysis. *J Pediatr Urol.* 2022;18(4):408-417. doi:10.1016/j.jpuro.2022.02.008
- Hofmann A, Rickard M, Santos JD, et al. Is vesicostomy still a contemporary method of managing posterior urethral valves? *Children.* 2022;9(2):138. doi:10.3390/children9020138
- Delefortrie T, Gareil J, Larré S, et al. Evaluating the impact of pop-off mechanisms in boys with posterior urethral valves. *Front Pediatr.* 2022;10:1014422. doi:10.3389/fped.2022.1014422
- Harper L, Bacchetta J, Gualtieri C, et al. Risk factors for febrile urinary tract infection in boys with posterior urethral valves. *Front Pediatr.* 2022;10:971662. doi:10.3389/fped.2022.971662
- Harper L, Bataille P, O'Brien M, et al. Circumcision and risk of febrile urinary tract infection in boys with posterior urethral valves: result of the CIRCUP randomized trial. *Eur Urol.* 2022;81(1):64-71. doi:10.1016/j.eururo.2021.08.024
- Massaguer A, Montero AJ, Rivas JO, et al. Pop-off mechanisms as protective factors against chronic renal disease in children with posterior urethral valves. *Cir Pediatr.* 2022;35(4):180-188.
- Rickard M, Braga LH, D'Souza N, et al. Prenatal hydronephrosis: bridging pre- and postnatal management. *Prenat Diagn.* 2022;42(9):1081-1091. doi:10.1002/pd.6114
- Keefe DT, Alshammari A, Sayed H, et al. Predictive accuracy of prenatal ultrasound findings for lower urinary tract obstruction: a systematic review and Bayesian meta-analysis. *Prenat Diagn.* 2021;41(9):1039-1048. doi:10.1002/pd.6025
- Wu CQ, DiCarlo HN, Gearhart JP, Smith EA. Role of a preoperative catheter regimen in achieving early primary endoscopic valve ablation in neonates with posterior urethral valves. *J Urol.* 2021;205(6):1792-1797. doi:10.1097/JU.0000000000001591
- Chan JYH, Khondker A, Malik S, Kim JK, Chua ME, Henderson B, et al. The contemporary management of posterior urethral valves: a systematic review and meta-analysis. *J Pediatr Urol.* 2022;18(5):561-569. doi:10.1016/j.jpuro.2022.06.014
- Kumar N, Jain S. Letter to the editor for the article "POIROT trial: post-operative imaging after urethroplasty with peri-catheter retrograde urethrography or trial of voiding with voiding cystourethrography". *World J Urol.* 2022;40(6):1601-1602. doi:10.1007/s00345-022-04003-5
- McLeod DJ, Szymanski KM, Gong E, et al. Renal replacement therapy and intermittent catheterization risk in posterior urethral valves. *Pediatrics.* 2019;143(3):e20182656. doi:10.1542/peds.2018-2656

**This article may be cited as:** Zaman M., Saeed Z., Qayum H., Khan M. K., Sohail M., Faiz S., To Evaluate the Relationship Between Antenatal Bladder wall Thickness and the Subsequent Development of Post-Ablation Detrusor Underactivity in Children with Posterior Urethral Valves *Pak J Med Health Sci.* 2023;17(12):893-897.