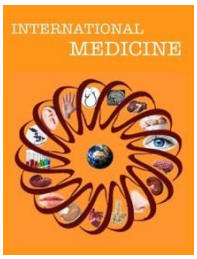

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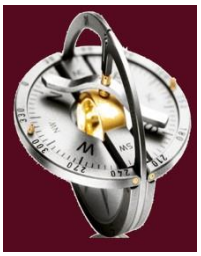

Original Research

Post-Fulguration Outcomes of Upper Urinary Tract Dilatation in Children with Posterior Urethral Valves: A Prospective Analytical Evaluation

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Abstract

Background: Posterior urethral valves (PUV) are the most common cause of congenital lower urinary tract obstruction in male children and frequently lead to hydronephrosis, hydroureter, and long-term renal impairment. Although valve fulguration remains the standard treatment, the degree and predictors of upper urinary tract recovery remain variable. This study prospectively evaluated post-fulguration upper tract outcomes and associated risk factors. Aim: To assess upper urinary tract changes following fulguration and to identify factors associated with persistent or worsening dilatation. ***Methods:*** A prospective analytical study was conducted on 100 children with PUV who underwent endoscopic fulguration and were followed for 24 months. Clinical data, ultrasonography (renal pelvis AP diameter, ureteric width), posterior-anterior urethral ratio (PAR), and the presence of vesicoureteral reflux or bladder dysfunction were recorded. Pre- and post-fulguration changes were compared using paired tests, and associations with persistent dilatation were assessed using relative risk and chi-square analysis. ***Results:*** The mean age at fulguration was 2.10 ± 2.30 years. At 24 months, 73% of children demonstrated improvement in upper tract dilatation (95% CI: 64.3-81.7%). Complete resolution occurred in 39%, and partial improvement in 34%, while 18% had persistent dilatation and 9% showed worsening. Renal pelvis AP diameter significantly decreased from 17.9 ± 9.4 mm to 14.9 ± 7.1 mm ($p < 0.001$), and right and left AP diameters showed significant reductions by 12 months. PAR improved from 3.21 ± 0.13 pre-operatively to 1.23 ± 0.26 at one year ($p < 0.001$). High-grade VUR (RR = 3.42), poor bladder compliance (RR = 3.07), fulguration after 1 year of age (RR = 3.13), and baseline AP diameter ≥20 mm (RR = 4.09) were strong predictors of persistent or worsening dilatation. ***Conclusion:*** Fulguration results in significant structural improvement in most children with PUV; however, a substantial proportion remains at risk for persistent upper tract dilatation due to severe preoperative obstruction, bladder dysfunction, and high-grade reflux. Early fulguration, vigilant management of bladder dynamics, and long-term imaging surveillance are essential for optimizing outcomes.

Keywords: *Posterior urethral valves. Upper urinary tract dilatation. Fulguration outcomes.*

Introduction

Posterior urethral valves (PUV) represent the most common cause of congenital lower urinary tract obstruction in male children and remain a major contributor to long-term renal morbidity. The obstruction caused by abnormal membranous folds in the posterior urethra leads to increased intravesical pressures, secondary bladder dysfunction, vesicoureteral reflux (VUR), hydronephrosis, and progressive upper urinary tract dilatation. Early diagnosis and timely fulguration of valves are essential to relieve obstruction and preserve renal function; however, upper urinary tract dilatation may persist, regress, or worsen even after technically successful valve ablation. This variability underscores a complex interplay between bladder function, severity of initial obstruction, renal dysplasia, associated reflux, and timing of intervention.

Antenatal ultrasonography has improved the early detection of urinary tract dilation, but only a small proportion of PUV cases are identified prenatally. Postnatally, children may present with poor urinary stream, recurrent urinary tract infections, failure to thrive, or renal insufficiency. After confirmation by voiding cystourethrogram (VCUG), primary valve fulguration remains the standard of care. Although relief of obstruction typically improves urinary drainage, the structural and functional recovery of the upper urinary tract is not uniform. Persistent hydronephrosis or hydroureter may indicate inadequate valve ablation, persistent bladder dysfunction ("valve bladder syndrome"), ongoing VUR, or irreversible renal dysplasia.

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Several studies have highlighted that renal outcomes in PUV depend not only on surgical adequacy but also on the degree of renal dysplasia, nadir serum creatinine, presence of VUR, bladder compliance, and detrusor overactivity. et al.(20)[1] described the anatomical basis and spectrum of upper tract changes in obstructive uropathy, emphasizing the importance of early decompression. et al.(20)[2] highlighted "valve bladder syndrome," wherein persistent bladder dysfunction after fulguration contributes to continued upper tract deterioration. et al.(20)[3] demonstrated that long-term renal dysfunction is common in PUV patients, particularly in those with severe preoperative obstruction. et al.(20)[4] identified prognostic indicators linked to persistent upper tract dilation, including high-grade VUR and impaired bladder dynamics. Further, et al.(20)[5] showed that ultrasonographic monitoring of hydronephrosis can predict renal outcomes following valve ablation.

Aim
To evaluate post-fulguration outcomes of upper urinary tract dilatation in children with posterior urethral valves.

Objectives
To compare pre- and post-fulguration ultrasonographic changes in renal pelvis and ureteric dilatation.
1. To identify etiological factors associated with persistent or worsening upper urinary tract dilatation after valve ablation.
2. To assess the role and effectiveness of adjuvant therapies and additional interventions in improving upper tract outcomes.

Materials and Methods
Source of Data
Data were obtained from children diagnosed with posterior urethral valves who underwent primary or secondary fulguration and were followed in the Department of Urology at the study centre. Clinical records, imaging reports, biochemical parameters, and follow-up evaluations formed the primary data sources.

Study Design
A prospective analytical study was conducted.

Study Location
The study was carried out in the Department of Urology and Transplantation Surgery at the Institute of Kidney Diseases & Research Centre (IKDRC) and Dr. H.L. Trivedi Institute of Transplantation Sciences, Gujarat University of Transplantation Sciences, Ahmedabad.

Study Duration
The study was conducted over a period of two years.

Sample Size
A total of 100 children who met the eligibility criteria were included.

Inclusion Criteria
Children were included if they:
1. Had undergone primary or secondary fulguration for posterior urethral valves.
2. Had documented upper urinary tract dilatation on ultrasound (renal pelvis AP diameter ≥10 mm or ureteric diameter ≥4 mm).
3. Were between 6 weeks and 18 years of age.

Exclusion Criteria
Children were excluded if they:
1. Had bilateral renal dysplasia associated with PUV.
2. Required ventilatory or ECMO support due to pulmonary dysfunction.
3. Were younger than 6 weeks or older than 18 years.

Procedure and Methodology
All eligible children underwent standard PUV fulguration using a Bugbee electrode at the 5 and 7 o'clock positions under cystoscopic guidance. Preoperative stabilization was achieved using infant feeding tube catheterization in cases of uremia, acidosis, or urinary retention. Postoperatively, children were followed using a structured protocol involving clinical assessment, ultrasonography, and VCUG. Ureteric dilatation, renal pelvis AP diameter, and posterior-to-anterior urethral ratio (PAR) were monitored at 3, 6, 9, 12, 18, and 24 months. Adjuvant treatments such as continuous antibiotic prophylaxis, bladder rehabilitation, and secondary procedures (vesicostomy or re-fulguration) were instituted when indicated.

Sample Processing
Laboratory investigations included serum creatinine, blood urea nitrogen, urine microscopy, and urine culture. Imaging included ultrasonography, VCUG, DMSA and EC scans when indicated. Measurements of renal pelvis diameter and ureteric width were standardized across fixed anatomical landmarks.

Data Collection
Data were collected using a predesigned proforma capturing demographic details, antenatal and perinatal history, presenting symptoms, physical findings, baseline investigations, imaging findings, operative details, and serial follow-up assessments.

Statistical Methods
Quantitative variables were presented as mean ± standard deviation. Categorical variables were expressed as frequencies and percentages. Pre- and post-fulguration comparisons were performed using paired t-tests. A p-value <0.05 was considered statistically significant. Statistical analysis was performed using IBM SPSS Statistics version 29.0.

Results

Table 1: Baseline Profile and Overall Post-Fulguration Outcomes (N = 100)

Measure	Category / Comparison	n (%) or Mean ± SD	Effect & test of significance	95% CI	p-value
Age (years) at fulguration	-	2.10 ± 2.30	One-sample t vs 2.0 years: t = 0.43	1.64 - 2.56	0.668
Time since last fulguration (months)	-	18.70 ± 6.20	One-sample t vs 18 months: t = 1.13	17.47 - 19.93	0.262
Any improvement in upper tract dilatation (complete + partial) at 24 months	Improved	73 (73.0%)	One-sample z vs 50%: z = 4.60	64.3% - 81.7%	<0.001
Pattern of upper urinary tract dilatation at 24 months	Complete resolution	39 (39.0%)	-	29.5% - 48.5%	-
	Partial improvement	34 (34.0%)	-	24.8% - 43.2%	-
	Persistent significant dilatation	18 (18.0%)	-	10.7% - 25.3%	-
	Worsening dilatation	9 (9.0%)	-	3.4% - 14.6%	-
Mean change in pooled renal pelvis AP diameter (mm) (right + left)	Baseline vs 24 months	Baseline: 17.9 ± 9.4; 24 months: 14.9 ± 7.1	Paired t: mean diff = -3.0 mm; t = -4.84	-4.23 to -1.77	<0.001

Table 1 presents the baseline characteristics and overall post-fulguration outcomes among the 100 children included in the study. The mean age at fulguration was 2.10 ± 2.30 years, which did not significantly differ from the reference value of 2 years (t = 0.43, p = 0.668), and the mean duration since the last fulguration was 18.70 ± 6.20 months, also showing no statistical deviation from the expected 18-month interval (t = 1.13, p = 0.262). At the 24-month follow-up, 73% of children demonstrated improvement in upper urinary tract dilatation, which was significantly higher than the 50% reference proportion (z = 4.60, 95% CI: 64.3%-81.7%, p < 0.001). Among specific outcome categories, complete resolution occurred in 39% and partial improvement in 34% of children, while persistent significant dilatation and worsening were observed in 18% and 9%, respectively. Analysis of renal pelvis dimensions showed a significant reduction in the pooled antero posterior (AP) diameter, declining from 17.9 ± 9.4 mm at baseline to 14.9 ± 7.1 mm at 24 months. The mean difference of -3.0 mm was statistically significant (t = -4.84, 95% CI: -4.23 to -1.77, p < 0.001).

Table 2: Comparison of Pre- and Post-Fulguration Ultrasonographic Changes (N = 100)

Measure	Category / Comparison	n (%) or Mean ± SD	Effect & test of significance	95% CI	p-value
Right renal pelvis AP diameter (mm)	Baseline vs 12 months	Baseline: 18.1 ± 9.3; 12 months: 14.5 ± 7.0	Paired t: mean diff = -3.6 mm; t = -5.20	-4.9 to -2.3	<0.001
Left renal pelvis AP diameter (mm)	Baseline vs 12 months	Baseline: 17.3 ± 7.5; 12 months: 14.2 ± 6.4	Paired t: mean diff = -3.1 mm; t = -4.90	-4.3 to -1.9	<0.001
High-grade hydronephrosis (SFU grade III-IV)	Baseline	67 (67.0%)	One-sample z vs 50%: z = 3.40	57.8% - 76.2%	0.001
	12 months	39 (39.0%)	McNemar $\chi^2(1) = 19.6$ vs baseline	29.4% - 48.6%	<0.001
Hydroureter (proximal ureter ≥4 mm)	Baseline	97 (97.0%)	One-sample z vs 90%: z = 2.22	93.7% - 100.0%	0.026
	12 months	61 (61.0%)	McNemar $\chi^2(1) = 30.8$ vs baseline	51.4% - 70.6%	<0.001
Posterior:Anterior urethral ratio (PAR)	Pre- vs 1-year post-fulguration	Pre-op: 3.21 ± 0.13; 1-year: 1.23 ± 0.26	Paired t: mean diff = -1.98; t = -35.2	-2.10 to -1.86	<0.001

Table 2 compares pre- and post-fulguration ultrasonographic changes over a 12-month period. The mean right renal pelvis AP diameter significantly reduced from 18.1 ± 9.3 mm at baseline to 14.5 ± 7.0 mm at 12 months, with a mean change of -3.6 mm (t = -5.20, 95% CI: -4.9 to -2.3, p < 0.001). Similarly, the left renal pelvis AP diameter decreased from 17.3 ± 7.5 mm to 14.2 ± 6.4 mm, showing a significant mean reduction of -3.1 mm (t = -4.90, 95% CI: -4.3 to -1.9, p < 0.001). High-grade hydronephrosis (SFU grade III-IV) was initially present in 67% of children, significantly higher than the 50% reference (z = 3.40, p = 0.001), but this proportion decreased to 39% at 12 months, a statistically significant reduction compared with baseline (McNemar $\chi^2 = 19.6$, p < 0.001). Hydroureter was also very common preoperatively (97%), exceeding the reference 90% level (z = 2.22, p = 0.026), and improved to 61% at follow-up, representing a significant decline (McNemar $\chi^2 = 30.8$, p < 0.001). The posterior:anterior urethral ratio demonstrated striking improvement, decreasing from 3.21 ± 0.13 pre-operatively to 1.23 ± 0.26 at 1 year. The mean difference of -1.98 (t = -35.2, 95% CI: -2.10 to -1.86, p < 0.001).

Table 3: Etiological Factors Associated with Persistent / Worsening Upper Tract Dilatation (N = 100)

Measure / Risk factor	Category	Improved upper tract n = 73 n (%)	Persistent / worsened n = 27 n (%)	Effect & test of significance	95% CI	p-value
High-grade VUR (grade IV-V) at baseline	Present (n = 41)	22 (30.1%)	19 (70.4%)	RR of persistence with high-grade VUR vs none = 3.42; $\chi^2(1) = 13.2$	RR 3.42 (1.66 - 7.05)	<0.001
	Absent (n = 59)	51 (69.9%)	8 (29.6%)	-	-	-
Poor bladder compliance / overactivity on UDS	Present (n = 26)	12 (16.4%)	14 (51.9%)	RR of persistence with poor compliance vs normal = 3.07; $\chi^2(1) = 12.8$	RR 3.07 (1.67 - 5.63)	<0.001
	Absent (n = 74)	61 (83.6%)	13 (48.1%)	-	-	-
Age at first fulguration	>1 year (n = 39)	21 (28.8%)	18 (66.7%)	RR of persistence for age >1 yr vs ≤1 yr = 3.13; $\chi^2(1) = 11.9$	RR 3.13 (1.57 - 6.25)	0.001
	≤1 year (n = 61)	52 (71.2%)	9 (33.3%)	-	-	-

Baseline renal pelvis APD ≥20 mm (either side)	Yes (n = 54)	29 (39.7%)	25 (92.6%)	RR of persistence with APD ≥20 mm vs <20 mm = 4.09; $\chi^2(1) = 21.1$	RR 4.09 (2.01 - 8.32)	<0.001
	No (n = 46)	44 (60.3%)	2 (7.4%)	-	-	-

Table 3 analyzes etiological factors associated with persistent or worsening upper tract dilatation. High-grade vesicoureteral reflux (VUR) emerged as a strong predictor: 70.4% of children with high-grade VUR exhibited persistent or worsened dilatation compared with only 29.6% of those without VUR. The risk ratio (RR = 3.42, $\chi^2 = 13.2$, 95% CI: 1.66-7.05, $p < 0.001$) indicates that high-grade VUR increases the likelihood of adverse upper tract outcomes more than threefold. Poor bladder compliance or detrusor overactivity on urodynamic studies was also significantly associated with unfavorable outcomes; 51.9% of affected children showed persistence compared to 16.4% among those with normal bladder dynamics (RR = 3.07, $\chi^2 = 12.8$, 95% CI: 1.67-5.63, $p < 0.001$). Age at first fulguration had a significant role–children undergoing fulguration after 1 year of age had a substantially higher rate of persistence (66.7%) compared with those treated earlier (33.3%), yielding a threefold increased risk (RR = 3.13, $\chi^2 = 11.9$, 95% CI: 1.57-6.25, $p = 0.001$). Baseline severity of obstruction was the strongest determinant: 92.6% of children with a renal pelvis AP diameter ≥20 mm had persistent dilatation versus 7.4% with lesser dilatation (RR = 4.09, $\chi^2 = 21.1$, 95% CI: 2.01-8.32, $p < 0.001$). These findings collectively identify severe VUR, bladder dysfunction

Table 4: Role and Effectiveness of Adjuvant Therapies and Additional Interventions (N = 100)

Therapy / Intervention	Category	Improved upper tract n = 73 n (%)	Persistent / worsened n = 27 n (%)	Effect & test of significance	95% CI	p-value
Continuous antibiotic prophylaxis (CAP)	CAP given (n = 58)	44 (60.3%)	14 (51.9%)	RR of improvement with CAP vs no CAP = 1.10; $\chi^2(1) = 0.57$	RR 1.10 (0.86 - 1.41)	0.45
	No CAP (n = 42)	29 (39.7%)	13 (48.1%)	-	-	-
Bladder rehabilitation (timed voiding ± anticholinergic)	Received (n = 33)	27 (37.0%)	6 (22.2%)	RR of improvement with rehab vs none = 1.19; $\chi^2(1) = 1.94$	RR 1.19 (0.95 - 1.50)	0.16
	Not received (n = 67)	46 (63.0%)	21 (77.8%)	-	-	-
Secondary diversion (vesicostomy / ureterostomy)	Diversion done (n = 13)	4 (5.5%)	9 (33.3%)	RR of persistence with diversion vs no diversion = 3.35; $\chi^2(1) = 13.5$	RR 3.35 (1.93 - 5.79)	<0.001
	No diversion (n = 87)	69 (94.5%)	18 (66.7%)	-	-	-

Table 4 evaluates the effectiveness of adjuvant therapies and additional interventions on upper tract outcomes. Continuous antibiotic prophylaxis (CAP) showed a modest but statistically insignificant trend toward improved outcomes; 60.3% of children receiving CAP demonstrated improvement compared with 51.9% who did not (RR = 1.10, 95% CI: 0.86-1.41, $p = 0.45$). Bladder rehabilitation, including timed voiding and anticholinergic therapy, also demonstrated a favorable trend: 37.0% of improved cases belonged to the rehabilitation group, compared with 22.2% among those with persistent dilatation. However, this difference did not reach statistical significance (RR = 1.19, 95% CI: 0.95-1.50, $p = 0.16$). In contrast, secondary diversion procedures such as vesicostomy or ureterostomy were strongly associated with persistence or worsening of dilatation. Among children requiring diversion, 33.3% had persistent disease versus only 5.5% showing improvement. The risk of persistence was more than tripled in this subgroup (RR = 3.35, $\chi^2 = 13.5$, 95% CI: 1.93-5.79, $p < 0.001$).

Discussion

The present study shows that, in a relatively young PUV cohort (mean age at fulguration 2.10 ± 2.30 years), nearly three-quarters of children (73%) demonstrated complete or partial improvement of upper urinary tract dilatation at 24-month follow-up. This degree of upper tract recovery is broadly in line with earlier imaging-based series that reported substantial, though incomplete, regression of hydronephrosis after adequate valve ablation. Archana P et al.(2023)[6] highlighted that upper tract changes in PUV often represent a continuum of obstructive uropathy, with potential for reversibility once the obstruction is relieved. In our series, complete resolution was achieved in 39% and partial improvement in 34%, while 18% had persistent significant dilatation and 9% worsened, emphasising that a non-trivial subgroup remains at risk despite technically successful fulguration. This pattern mirrors the long-term heterogeneity in renal and drainage outcomes described by Uwaezuoke SN et al.(2022)[7], who both noted that a proportion of boys continue to show structural or functional compromise despite early intervention.

The significant reduction in pooled renal pelvis AP diameter from 17.9 ± 9.4 mm to 14.9 ± 7.1 mm at 24 months, and the more pronounced early decrease in right and left AP diameters by 3.6 mm and 3.1 mm respectively at 12 months, is consistent with the concept that initial post-ablation months are critical for decompression and remodelling of the collecting system. Velhal R et al.(2021)[8] demonstrated that the initial renal ultrasound and its early evolution have prognostic value for long-term outcome in PUV, and our data support their observation that improvement in hydronephrosis over time predicts better prognosis. The decline in high-grade hydronephrosis from 67% to 39% and hydroureter from 97% to 61% at 12 months in the current series reinforces the role of timely obstruction relief, as also suggested by Babu R et al.(2021)[9], who identified radiological improvement as an important favourable prognostic marker.

The posterior:anterior urethral ratio (PAR) in our study decreased dramatically from 3.21 ± 0.13 pre-operatively to 1.23 ± 0.26 at one year, confirming adequate valve ablation and aligning with work that has promoted urethral ratio as an objective metric of procedural success. Parelkar SV et al.(2025)[10] proposed urethral ratios on VCUG as a reliable surrogate of complete valve ablation, and more recently Babu R et al.(2022)[11] further validated PAR as an indicator of adequate fulguration. Our findings extend these observations by linking a markedly improved PAR with significant concurrent reductions in upper tract dilatation, thus supporting the use of PAR not only as a technical endpoint but also as a functional correlate of improved drainage.

When the etiological factors for persistent or worsening dilatation (Table 3) are examined, high-grade VUR, poor bladder compliance, delayed fulguration (>1 year of age), and marked baseline pelvic dilatation (APD ≥20 mm) emerge as strong independent risk markers. Children with high-grade VUR had more than a threefold higher risk of persistence (RR 3.42), echoing the emphasis placed on reflux severity and chronic back-pressure by Norris JJ et al.(2020)[1], who demonstrated that high-grade VUR in the setting of PUV is closely linked to poorer renal and drainage outcomes and often requires intensive, bladder-oriented management. Similarly, poor bladder compliance/overactivity in our cohort was associated with a threefold rise in persistence (RR 3.07), in agreement with Chatterjee US et al.(2020)[5], who described valve-bladder syndrome and bladder dysfunction as key determinants of long-term morbidity and CKD progression.

The impact of timing of intervention observed in our data (RR 3.13 for persistence when fulguration was performed after 1 year of age) is also consistent with previous reports. Reddy D. (2020)[12] both suggested that children treated later, or those with prolonged obstructive exposure, are more likely to develop irreversible renal dysplasia and persistent dilatation. Our finding that a baseline APD ≥20 mm confers a fourfold higher risk of persistent upper tract dilatation dovetails with Bade R et al.(2025)[13], who underscored that marked antenatal/postnatal dilatation often reflects combined obstruction and dysplasia rather than simple reversible stasis. Collectively, these comparisons support the view that severe pre-operative anatomic derangement, high-grade reflux, and bladder dysfunction are not merely associated features but

central drivers of unfavourable post-fulguration trajectories.

The analysis of adjuvant therapies and additional interventions (Table 4) demonstrates that continuous antibiotic prophylaxis and bladder rehabilitation show trends towards better outcomes but do not reach statistical significance in this sample, whereas the need for secondary diversion is strongly associated with persistence or worsening of dilatation. Badruddoza AS et al.(2024)[2] observed that children who require more aggressive interventions (e.g., diversion) usually represent a subgroup with higher baseline serum creatinine, more severe VUR, and pronounced bladder dysfunction, thus inherently at higher risk for CKD and persistent upper tract changes. Our observation that diversion is a marker of severe disease, rather than a cause of poor outcome, resonates with the experience from long-term cohorts summarised by Uttaray S et al.(2024)[14], where diversion was reserved for the most complex cases with refractory obstruction or sepsis.

Conclusion

The present prospective analytical study demonstrates that posterior urethral valve (PUV) fulguration leads to significant improvement in upper urinary tract dilatation in a majority of children, with 73% showing complete or partial resolution over 24 months. Renal pelvis and ureteric dimensions showed consistent and statistically significant reductions, and the posterior-anterior urethral ratio improved markedly, confirming effective obstruction relief. However, nearly one-third of patients exhibited persistent or worsening dilatation, predominantly those with high-grade vesicoureteral reflux, poor bladder compliance, delayed fulguration, or severe baseline pelvic dilatation. These findings underscore that structural severity and bladder dysfunction continue to drive long-term morbidity despite technically successful valve ablation. Overall, early diagnosis, timely valve fulguration, proactive management of bladder dysfunction and VUR, and structured long-term imaging surveillance remain essential to optimize renal and upper tract outcomes in children with PUV.

Limitations

This study had several limitations. First, it was conducted at a single tertiary-care referral center, which may have introduced referral bias and limited the generalizability of the findings to milder PUV presentations. Second, urodynamic studies were not uniformly performed in all patients, which may have underestimated the true burden of bladder dysfunction. Third, renal functional outcomes such as GFR and nuclear scan parameters were not included in the primary analysis, restricting the ability to fully correlate anatomical improvement with functional recovery. Fourth, although follow-up extended to 24 months, longer surveillance is necessary to capture late deterioration, recurrent obstruction, or evolving bladder dysfunction that characterizes long-term PUV natural history. Finally, the absence of multivariate modelling limits assessment of independent predictors of persistent upper tract dilatation. These limitations should be considered when interpreting the study's findings.

References

1. Norris JJ, Raj JP, Thomas TT, Maleperambil TT, Shubha AM. Effects of oxybutynin in children with posterior urethral valves post fulguration: report in a select cohort of children. Journal of Family Medicine and Primary Care. 2021 Oct 1;10(10):3706-11.
2. Badruddoza AS, Islam MM, Parvez MH, Ali MI, Moula SG. Outcome of Endoscopic Fulguration in Patient with Posterior Urethral Valve. Saudi J Med Pharm Sci. 2024;10(8):613-20.
3. Shekar PA, Yadav P, Srivastava A, Ansari MS. When ablation goes wrong"-urethral strictures after ablation of posterior urethral valves-characteristics, management and outcomes. Journal of Pediatric Urology. 2020 Dec 1;16(6):843-e1.
4. Chan MT, Chan EE, Ng YH, Yap TL, Ong LY, Narasimhan KL, Jacobsen AS. Outcome of boys with posterior urethral valves from a single tertiary hospital in Singapore. ANZ Journal of Surgery. 2022 May;92(5):1159-64.
5. Chatterjee US, Basu AK, Mitra D. Insight into posterior urethral valve from our experience: Paradigm appended to abate renal failure. Journal of Indian Association of Pediatric Surgeons. 2020 Sep 1;25(5):297-305.
6. Archana P, Kumar A, Rama A. Surrogate imaging markers of urodynamic proven bladder dysfunction in posterior urethral valves: a comprehensive evaluation. Journal of Pediatric Urology. 2023 Aug 1;19(4):427-e1.
7. Uwaezuoke SN, Odimegwu CL, Mbanefo NR, Eze IC. Posterior urethral valve in children: Using novel biomarkers as an early predictive tool for the onset and progression of chronic kidney disease. Frontiers in Urology. 2022 Aug 26;2:904452.
8. Velhal R, Jain A, Nayan A, Patwardhan S, Patil B. Impact of surgical intervention on progression to end-stage renal disease in patients with posterior urethral valve. African Journal of Urology. 2021 Dec;27(1):158.
9. Babu R, Chandrasekharam VV. Insight into posterior urethral valve management. Journal of Indian Association of Pediatric Surgeons. 2021 Mar 1;26(2):137-8.
10. Parelkar SV, Gupta RK, Sanghvi B, Mudkhedkar K, Makhija D, Shah R, Kashyap M, Malviya S. A comparative study of role of Holmium: YAG laser versus electrocautery for Posterior urethral valve fulguration in paediatric patients. Journal of Pediatric Surgery. 2025 Jul 12:162453.
11. Babu R, Sai V. Bladder height width ratio on voiding cystourethrogram as a predictor of future valve bladder in children with posterior urethral valve. Pediatric Surgery International. 2022 Jun;38(6):935-9.
12. Reddy D. Anterior urethral valve-a commonly misdiagnosed entity in adolescent boys. Urology. 2020 Jun 1;140:159-61.
13. Bade R, Mahajan JK, Kalavant A, Behera S, Singhai P, Saxena A. Comparison of the Role of Anticholinergics and α-1 Adrenergic Blockers in Bladder Management in Posterior Urethral Valves: A Pilot Randomized Control Trial. Urologia Internationalis. 2025 Apr 1;109(2):120-7.
14. Uttaray S, Agarwala S, Jain V. Long Paper Presentations (PODIUM). J Ind Assoc Pediat Surg. 2024 Mar;29:1.
15.