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Original Research Article

The importance of re-look urethrocystoscopy after fulguration of posterior urethral valve

Mahmudul Hasan[1]*, Khandaker Mahadiul Haque[1], Kanij Fatema[2], Mohammad Abdur Rahman[3], M. Masud Rana Badol[1], Abdullah Al Mamun[1], Isteaq Ahmed Shameem[1]

[1]Department of Urology, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh
[2]District Sadar Hospital, Rajbari, Bangladesh
[3]Upazila Health Office, Sadar, Rajbari, Bangladesh

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***Correspondence:**
Dr. Mahmudul Hasan,
E-mail: dr.mahmuduro@gmail.com

ABSTRACT

Background: Endoscopic fulguration is the gold-standard treatment for posterior urethral valve (PUV). However, there is no consensus on detecting residual valves post-fulguration. Some urologists advocate re-look urethrocystoscopy (UC), while others recommend voiding cystourethrograms (VCUG). This study evaluates the significance of re-look UC after initial PUV fulguration.
Methods: This observational study involved 28 patients undergoing re-look UC post-fulguration due to persistent symptoms, elevated serum creatinine, or abnormalities in uroflowmetry and ultrasonography (e.g., high post-void residual (PVR) or hydroureteronephrosis). Continuous data were analyzed using the Wilcoxon signed-rank test and categorical data with Fischer's exact test, with $p<0.05$ deemed significant.
Results: The median age for re-look UC was 7 years. Symptoms included weak urinary stream (92.9%), straining (75%), dribbling (71.4%), and others. Hydroureteronephrosis was noted in 92.9% of cases, and 50% had elevated serum creatinine. Residual valves were detected in 21.4% of patients three months after initial fulguration. Residual PUV was associated with a higher median age of 10 years ($p=0.045$). No significant associations were found between residual PUV and hydroureteronephrosis, PVR, or serum creatinine levels.
Conclusions: Re-look UC is crucial for detecting residual valves, enhancing clinical outcomes, and improving long-term bladder function. Integrating re-look UC into PUV management protocols is recommended to ensure comprehensive patient care.

Keywords: Endoscopic fulguration, Posterior urethral valve, Re-look urethrocystoscopy, Voiding cystourethrograms

INTRODUCTION

Posterior urethral valves (PUV) represent a life-threatening congenital anomaly that leads to lower urinary tract obstruction in male neonates.[1] The incidence is reported to be approximately 1 in 7,000 to 8,000 live births.[2] Clinical manifestations of PUV vary based on the extent of bladder outlet obstruction, which is defined by the severity and configuration of the valves. Potential complications include vesicoureteric reflux, recurrent urinary tract infections (UTIs), voiding dysfunction, valve bladder syndrome, chronic renal failure, and even mortality if not managed promptly.

The primary objective in treating PUV is to preserve renal function, prevent infection, and maintain a low-pressure bladder with adequate volume. Managing PUV presents significant challenges, necessitating long-term

follow-up to avert progressive damage to both upper and lower urinary tracts. The gold-standard approach is the early endoscopic fulguration of PUV.[3] Although many patients show clinical improvement post-fulguration, some may experience persistent voiding symptoms due to residual valves or urethral strictures. Residual valve remnants have been documented in 10-30% of cases, contributing to dysfunction of the urinary bladder and the upper urinary tract. Therefore, achieving complete resolution of infravesical obstruction is critical for favorable long-term outcomes.[4]

Currently, there are no definitive guidelines for follow-up care after primary fulguration of PUV. Various assessment tools, including VCUG, videourodynamics, and re-look UC, have been suggested to evaluate the adequacy of the procedure. While some urologists prefer re-look UC to detect residual valves or strictures, others use VCUG to determine the posterior-to-anterior urethral ratio, with no consensus on definitive cut-off values for indicating residual obstruction.[5]

A considerable number of patients with residual valves have been identified through re-look UC that were missed on VCUG, which also has significant false negative and positive predictive rates, making it an imprecise standalone assessment.[6] Performing re-look UC three months after fulguration is essential for confirming the completeness of the procedure and can significantly mitigate long-term complications.[5] This study evaluates the importance and effectiveness of re-look UC in detecting residual valve remnants following PUV fulguration.

Following the fulguration of PUVs, most patients exhibit clinical improvement; however, some continue to experience persistent voiding symptoms due to residual valves or urethral strictures. The complete resolution of valves is crucial in determining long-term outcomes for these patients. Currently, there is no consensus on the best method for detecting residual valves post-fulguration. While some urologists advocate for VCUG to assess the adequacy of valve fulguration, others recommend re-look UC.

It is important to address that VCUG is an invasive procedure that carries significant risks, including life-threatening complications such as urosepsis, which has a mortality rate as high as 30-40%. By opting for re-look UC, we can mitigate the need for invasive VCUG while simultaneously evaluating the adequacy of valve fulguration and performing necessary complete ablation of any residual valves.

To the best of our knowledge, no such study has been conducted at the urology department of Bangabandhu Sheikh Mujib medical university (BSMMU). In this study, re-look UC was performed three months post-fulguration if the child exhibited persistent obstructive voiding symptoms, rising serum creatinine levels, or abnormalities in uroflowmetry and ultrasound, such as high PVRs and progressing hydroureteronephrosis. This approach aims to assess the critical role of re-look UC after the initial PUV fulguration.

The objective of this study is to evaluate the role of re-look UC following the fulguration of (PUVs. Specifically, the study aims to assess the baseline condition of patients diagnosed with PUV, evaluate their initial status, conduct UC and fulguration of PUV, and perform re-look UC in patients suspected of having residual PUV. Additionally, the study aims to determine the proportion of patients exhibiting residual PUV, evaluate the condition of the urinary bladder and bladder neck, and measure PVR urine volume using ultrasound.

METHODS

This cross-sectional observational study was conducted in the department of urology at Bangabandhu Sheikh Mujib medical university, Dhaka, Bangladesh, from April 2022 to August 2023. It involved patients diagnosed with PUVs who were admitted for fulguration but continued to experience voiding symptoms along with raised serum creatinine levels, abnormal uroflowmetry, and ultrasound findings of high PVR and progressive hydroureteronephrosis. Ethical clearance was obtained from the institutional review board of BSMMU prior to the study.

Following IRB approval, written informed consent was secured from the guardians of all participants. Initial fulguration was performed along with comprehensive clinical evaluations that included detailed history, physical examinations, laboratory tests, and imaging studies. Patient management included administering an intravenous antibiotic at anesthesia induction, performing UC for valve inspection, and applying fulguration as needed. Post-operative catheters were placed and removed after 48 to 72 hours. Regular follow-ups at three months involved evaluating medical history, performing physical exams, laboratory tests, and imaging. For patients with persisting obstructive symptoms, further assessments were performed to check for residual valve tissue, which was also subject to fulguration.

Data collection included demographic information, medical history, examination findings, and treatment outcomes, documented through patient interviews. The data were analyzed using SPSS software, employing Wilcoxon signed-rank tests and Fisher exact tests for assessing variable associations, with statistical significance defined as $p<0.05$. Ethical considerations were strictly adhered to, ensuring participant confidentiality and voluntary participation, with rights and risks clearly communicated during the informed consent process and its execution.

Patients included were those with PUV who underwent fulguration and had persistent symptoms, rising serum

creatinine, or abnormal findings in uroflowmetry or ultrasonography (e.g., high PVR or hydroureteronephrosis) and re-look UC was performed at 3 months. Excluded were severely ill or low-birth-weight children, those whose fulguration was performed outside BSMMU, or had a history of vesicostomy, cutaneous ureterostomy, end-stage renal disease, or active UTI.

RESULTS

In the study, maximum (11) patients (39.3%) were in the age group of 1 to 5 years, while the minimum (10) number of patients (35.7%) fell within the 6 to 10 years age range. The median age of all patients was 7.0 years.

Table 1: Distribution of patients by age, (n=28).

Age groups (in years)	N (%)
1-5	11 (39.3)
6-10	10 (35.7)
11-14	7 (25.0)
Median [IQR]	7.0 [2.0, 10.7]

Table 2 shows that at baseline, 26 (92.9%) patients had weak urinary stream, 21 (75.0%) had straining during micturition, 20 (71.4%) had dribbling of urine, 10 (35.7%) had recurrent attack of fever, another 10 (35.7%) patients cried during micturition and one (3.6%) had urinary retention. Three months after surgery, 10 (39.3%) patients had weak urinary stream, 3 (10.7%) had straining during micturition, 7 (25.0%) had dribbling of urine, one (3.6%) had recurrent attack of fever. None of them cried during micturition and had urinary retention.

Table 2: Distribution of patients by symptoms, (n=28).

Criteria	Symptoms at baseline, N (%)	Symptoms after 3 months, N (%)
Weak urinary stream	26 (92.9)	10 (39.3)
Straining during micturition	21 (75.0)	3 (10.7)
Dribbling of urine	20 (71.4)	7 (25.0)
Recurrent attack of fever	10 (35.7)	1 (3.6)
Crying during micturition	10 (35.7)	0 (0.0)
Urinar retention	1 (3.6)	0 (0.0)

Table 3 shows that at baseline, 6 (21.4%) patients had positive CS, 1 (3.6%) had electrolyte imbalance and 26 (92.9%) had hydroureteronephrosis. The median creatine value was 0.69. The median Qmax and PVR were 7.7 and 31.0 respectively. Three months after surgery, 2 (7.2%) patients had positive CS, none had electrolyte imbalance and 25 (89.3%) had hydroureteronephrosis. The median creatine value was 0.67. The median Qmax and PVR were 11.2 and 25.0 respectively.

Table 3: Distribution of patients by laboratory parameters, (n=28).

Criteria	Preop investigations, N (%)	Postop investigations, N (%)
Positive CS	6 (21.4)	2 (7.2)
Electrolyte imbalance	1 (3.6)	0 (0.0)
Hydroureteron ephrosis	26 (92.9)	25 (89.3)
Creatinine, median (IQR)	0.69 (0.43, 1.07)	0.67 (0.49, 1.28)
Qmax, median (IQR) (n=26)	7.7 (6.4, 8.3)	11.2 (8.4, 15.0)
PVR, median (IQR)	31.0 (22.2, 64.2)	25.0 (12.2, 38.7)

IQR=Interquartile range, PVR=post-void residual, Qmax=Maximum flow rate

Table 4 shows that at primary fulguration, 13 (46.4%) patients had normal bladder neck while 11 (39.3%) had high and 4 (14.3%) had hypertrophied bladder neck. Two (7.1%) patients had grade 0 trabeculation while 3 (10.7%) patients had grade 1 trabeculation, 11 (39.3%) patients had grade 2 trabeculation and 12 (42.9%) patients had grade 3 trabeculation. At re-look UC, 14 (50.0%) patients had normal bladder neck while 11 (39.3%) had high and 3 (10.7%) had hypertrophied bladder neck. Five (17.9%) patients had grade 0 trabeculation while 2 (7.1%) patients had grade 1 trabeculation, 18 (64.3%) patients had grade 2 trabeculation and 3 (10.7%) patients had grade 3 trabeculation.

Table 4: Distribution of patients by UC, (n=28).

Urethro-cystoscopy	At primary fulguration, N (%)	At re-look UC, N (%)
Bladde neck		
Normal	13 (46.4)	14 (50.0)
High	11 (39.3)	11 (39.3)
Hypertrophied	4 (14.3)	3 (10.7)
Urinary bladder		
Grade 0 trabeculation	2 (7.1)	5 (17.9)
Grade 1 trabeculation	3 (10.7)	2 (7.1)
Grade 2 trabeculation	11 (39.3)	18 (64.3)
Grade 3 trabeculation	12 (42.9)	3 (10.7)

Table 5 shows that at 3 month, 22 (78.6%) patients did not have any residual PUV while 6 (21.4%) patients had residual PUV.

Table 5: Distribution of patients by residual PUV at 3 months, (n=28).

Residual PUV at 3 months	N (%)
Present	6 (21.4)
Absent	22 (78.6)

Table 6: Relationship of presence of residual PUV at 3 months with independent variables.

Variables	Residual PUV at 3 months		P value
	Absent	Present	
Age (in years)	6.5 (2.0, 10.2)	10.0 (8.0, 13.2)	0.045[a]
Hydroureteronephrosis at baseline			
Absent	2 (9.1%)	0 (0.0%)	0.999[b]
Present	20 (90.9%)	6 (100.0%)	
Hydroureteronephrosis at 3 months			
Absent	3 (13.6%)	0 (0.0%)	0.999[b]
Present	19 (86.4%)	6 (100.0%)	
PVR at baseline	28.5 (22.7, 50.7)	27.0 (7.5, 95.2)	0.935[a]
PVR at 3 months	25.0 (12.7, 36.2)	55.5 (16.2, 120)	0.460[a]
Creatinine at baseline	0.56 (0.4, 1.0)	0.9 (0.7, 1.8)	0.100[a]
Creatinine at 3 months	0.6 (0.4, 0.9)	1.1 (0.6, 1.9)	0.068[a]

a=Wilcoxon signed-rank test, b=Fisher Exact test

Table 6 shows that patients with residual PUV at 3rd month had higher median age (10.0 years) compared to patients without residual PUV at 3rd month (6.5 days) (p=0.045). There was no significant association between presence of residual PUV at 3rd month and hydroureteronephrosis at baseline (p=0.999), hydroureteronephrosis at 3rd month (p=0.999), PVR at baseline (p=0.935), and PVR at 3rd month (p=0.460), creatinine at baseline (p=0.100), and creatinine at 3rd month (p=0.068)

DISCUSSION

Endoscopic fulguration of valve is the preferred initial surgical treatment in most patients with PUV. Incidence of residual PUV after fulguration is not low. The absence of obstructive residual valve should be confirmed by careful clinical, radiological and endoscopic evaluation after surgery.[8] Some urologists suggest VCUG to confirm the adequacy of valve fulguration, whereas some recommend re-look UC.[6] There is no consensus regarding follow up after fulguration of PUV.[6] Fifteen reported that VCUG alone is inexact test for excluding residual valve tissue (positive and negative predictive value of 56% and 50%, respectively).

In our study, the median age of the patients were 7 years during re-look UC. This finding is not similar with study of Nawaz et al, Mirshemirani et al, Malik et al and Sundarsanan et al.[7,10] The higher age at presentation in our study is most probably due to delayed attend to specialist because of lacking awareness of the parents and faulty referral system.

Shirazi et al studied several preoperative variables as prognostic factors for the risk of residual valve.[11] They found that the risk of residual valve was higher with younger age group at the time of valve fulguration. The presence of increased renal echogenicity, the presence and grade of vesico-ureteric reflux were also significantly higher in patients with residual valve. In our study, we found the only variables that had a statistically significant (p=0.045) relationship with the risk of having residual valve was the age at initial fulguration. On the contrary to Shirazi et al we found that higher age patients were associated with a higher risk of residual valve in the re-look UC.[11] This finding was consistent with the study of Nabil et al who also found the relationship of higher age at presentation with the presence of residual valve.[12] The explanation of this finding is the probability of valve hypertrophy caused by long standing high pressure on the valve leaflets with higher age.

The most common presentations in our study at baseline and three months after initial fulguration were weak urinary stream 92.9%/39.9%, straining during micturition 75%/10.7%, dribbling of urine 71.4%/25%, recurrent attack of fever 35.7%/3.6%, crying during micturition 35.7%/0%, acute urinary retention 3.6%/0%, hydroureteronephrosis 92.9%/89.3%, culture positive UTI 21.4%/7.2%. These findings were consistent with the study of Nawaz et al, Mirshemirani et al, Malik et al and Sundarsanan et al.[7,9,10] The relationship of presence of residual valve at 3 months was assessed with both the pre and post fulguration hydroureteronephrosis. There was no significant association between presence of residual valve at 3rd month with hydroureteronephrosis at baseline (p=0.999) and hydroureteronephrosis at 3rd months (p=0.999).

Our study revealed a 21.4% (6/28) incidence of residual valve on re-look UC. This is lower compared to the findings of Nawaz et al (78%, 39/50), Nabil et al (60%, 30/50, Oktar et al (47.6%, 10/21) and Imaji et al (47%).[9,12,13] The lower incidence in our study can be attributed to performing re-look UC selectively, only when clinical suspicion of residual valve was present. Conversely, Nawaz et al, Nabil et al, and Imaji et al conducted re-look UC on all patients, regardless of clinical improvement, which likely contributed to their higher reported rates.[9,12,13] Mirshemirani et al (15.3%), Schoberet et al (25%), Basu et al (6.2%), Sundarsanan et al (13%) and Lal et al (13.4%) also reported lower incidences, as they similarly performed re-look UC only when residual valve was clinically or radiologically suspected.[10,14]

PVR urine was measured using ultrasonography both preoperatively and three months post-fulguration. The

median preoperative PVR was 31ml, while the median post-fulguration PVR at three months was 25 ml. Statistical analysis revealed no significant correlation between the presence of a residual valve at the 3-month mark and PVR at baseline (p=0.935) or PVR at 3 months (p=0.460).[15] Elevated PVR levels are indicative of urinary retention. The relationship between PVR and residual valve has also been explored.

Our study found no instances of urethral stricture on re-look UC. This contrasts with the findings of Crooks et al (8%), Sundarsanan et al (8.2%), Choudhury et al (3.6-25%), Nawaz et al (8%), Myers et al (25%), Lal et al (3.6%), and Mirshemirani et al (7.1%), Nijman et al (0%).[7,9,10] Prior studies have correlated urethral stricture formation with factors such as dry fulguration, preoperative per-urethral catheterization, redo fulguration, use of oversized instruments, loop electrode use, and bladder neck incision with valve fulguration. The absence of urethral stricture in our study is likely due to meticulous surgical technique, appropriate instrument sizing, minimized fulguration time, avoidance of excessive and deep fulguration, direct visualization during fulguration, and a relatively short follow-up period.

One patient in our study (1/28, 3.57%) developed a UTI following re-look UC. The UTI diagnosis was based on a thorough history, physical examination, and laboratory investigations, including urine routine microscopic examination and culture sensitivity testing (2023). The patient was effectively managed with oral culture-specific antibiotic therapy. UTIs can be diagnosed and managed using the methods we implemented (2023).

A key limitation of our study stems from the fact that fulguration procedures were performed by different surgeons which may introduce variability in technique and outcomes.

CONCLUSION

A significant number of patients may have residual valve that may be seen and treated at re-look UC that will not always be seen on imaging studies. The earlier the obstruction is entirely removed, the better the long-term outcome. So, we suggest routine re-look UC after initial fulguration of PUV if the child is symptomatic, any abnormality in serum creatinine and electrolytes, uroflowmetry and ultrasonogram.

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