# Endoscopic management of bladder calculi in paediatric male patients: An experience with 57 patients

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**ABSTRACT**

**Objective:** To determine the efficacy and safety of transurethral pneumatic lithotripsy for bladder calculi in pediatric male patients.
**Study design:** An interventional study.
**Place and Duration of Study:** Department of Urology Foundation University Medical College and Fauji Foundation Hospital Rawalpindi, from January 1, 2012 to December 31,2017.
**Methodology:** A total of 57 pediatric male patients with bladder stone were included in the study by non probability convenient sampling. Transurethral pneumatic lithotripsy was performed in all the patients. Efficacy of the procedure was assessed by the duration of the procedure, hospital stay, stone fragmentation and safety was assessed by the type and number of any per or post-operative complications.
**Results**: Mean hospital stay was 1.05±0.225 days. Mean operating time was28.12±9.44 mins. Minor complications were noted in 28.07 % patients which included dysuria in 10.5%, hematuria in 7% difficulty in passing urine in 5.3%, fever in 3.5% patients and acute urinary retention in 1.8% patients.
**Conclusion:** Transurethral pneumatic lithotripsy using semi rigid ureterorenoscope is a safe and effective modality in the treatment of bladder calculi up to 25mm in pediatric male patients.
**Keywords:** Pediatric male patients, Bladder stone, Endourology, Transurethral pneumatic lithotripsy, Ureterorenoscope, Management, Efficacy, Safety.

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## INTRODUCTION

The occurrence of urinary stones in children has not been documented in a systematic population based manner. The available literature reports geographical difference between various regions. In the recent decade there has been a considerable rise in the number of pediatric patients diagnosed with urinary stone disease[1]. According to literature, during childhood period about 2–3% of children will develop a urinary stone[2]. Stone disease is associated with significant morbidity in pediatric population. Possible causes of occurrence of urolithiasis in this age group are metabolic disorders, urinary tract abnormalities and infection[3,4]. Geographically Pakistan is located at the center of the Afro-Asian stone belt, an area where urinary stones are highly prevalent. Urinary stones have high prevalence in Pakistan where adults and children are affected alike. Endemic bladder stones are mostly seen in developing nations where dietary protein is for the most part obtained from plant sources instead of meat. Vesical calculi have been reported in up to 31% of children with urinary stones[5]. In Pakistan the geographical distribution of bladder calculi in children is under a transitional phase. The problem remains endemic in rural areas and in the poor areas of large urban communities in the country[6].

Globally urinary stones are routinely managed by various endoscopic techniques in teaching as well as community based hospitals. There are currently a variety of approaches to the patients with bladder stones. Commonly accepted modalities include transurethral lithotripsy with pneumatic or laser energy, extracorporeal shockwave lithotripsy, percutaneous suprapubic lithotripsy or open surgery[7]. However male children with vesical calculi are being treated by cystolithotomy in majority of the

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hospitals in developing countries[8]. The miniaturization of endourological equipment, coupled with increasing experience of endourologists in minimally invasive techniques, has opened the opportunity to manage vesical calculi in male children through endoscopic technique[9].

Transurethral pneumatic lithotripsy has proved to be an effective modality in the treatment of bladder stones in adults[10]. Its role as a safe and effective modality in the transurethral management of bladder stones in male Paediatric patients is being increasingly reported in literature[6].

The present study was carried out to determine the efficacy and safety of transurethral pneumatic lithotripsy using a semi rigid ureterorenoscope in paediatric male patients with bladder stones in terms of duration of the procedure, hospital stay, stone fragmentation, stone clearance and occurrence of any per or post operative complication.

## METHODOLOGY

This interventional study was carried out at the Department of Urology, FUMC, Fauji Foundation Hospital, Rawalpindi from January 1st, 2012 to December 31st, 2017 after obtaining approval from the hospital ethical committee. Male paediatric patients between 2-12 years of age, bladder stone between 5mm-25mm, a negative urine culture and normal coagulation profile were included in the study. Female pediatric patients, male pediatric patients <2 years or >12years stone size <5mm or >25mm, patients with active urinary tract infection and abnormal coagulation profile were excluded from the study.

Patients' evaluation was done by a detailed history followed by physical examination, urine culture, complete blood count and serum creatinine were obtained. Radiological investigation included an X-ray KUB and an Ultrasound KUB. Stone size was assessed by Ultrasound scan. Anaesthesia fitness was sought and an informed consent was taken from the parents.

All procedures were done under general anaesthesia by a consultant urologist. Three doses of intravenous ceftriaxone were administered in the peri operative period. Urethrocystoscopy was done in lithotomy postion using Paediatric cystoscope 4.5 Fr in children up to 5 years and by a semi rigid ureterorenoscope 7/8.5 Fr in children more than 5 years to rule out any lower urinary tract abnormality and stone visualization. Pneumatic lithoclast was used for stone fragmentation using 1 mm probe passed via ureterorenoscope 7/8.5 Fr.Bladder was decompressed by gentle suprapubic pressure applied by the assistant's hand resulting in peri-scope leakage of irrigant. Stones were fragmented into multiple small pieces which could easily pass out during voiding. After the completion of procedure a Foley catheter of appropriate size was passed. Catheter was removed early morning on the first post-operative day. Patients were directed to void on a surgical gauze to ensure passage of stone fragments. In cases where no urinary obstruction was observed, patients were discharged the same day with an advice to follow up in OPD after 7 days with a fresh ultrasound KUB.

Duration of the procedure, stone fragmentation, hospital stay, any per or post-operative complications like hematuria, dysuria, fever, residual stones, difficulty in passing urine and urinary retention were recorded on a preformed Performa.

**Data Analysis:** Data was analyzed using SPSS version 16. Qualitative data was expressed in percentage and quantitative data expressed in mean ± SD.

## RESULTS

A total of 57 male Paediatric patients having diagnosis of bladder stone were incorporated in our study. All were managed by transurethral pneumatic lithotripsy. Age range was from 2 to 12 years and mean age was 7.74±2.64 years.

Common presenting symptoms were difficulty in passing urine recorded in 39 patients (68.4%), followed by dysuria in 35 patients (61.4%), lower abdominal pain in 31 patients (41.3%) lower urinary tract symptoms, hematuria, and acute urinary retention was observed in 15 (26.3%), 14(24.5%) and 7 (12.2%) patients respectively (Table-I).

**Table-I: Frequency of common clinical presentations (N=141)**

| Clinical presentation | Number of patients |
|---|---|
| Difficulty in passing urine | 39 (68.4%) |
| Dyusria | 35 (61.4%) |
| Lower abdominal pain | 31 (41.3%) |
| Lower urinary tract symptoms | 15 (26.3%) |
| Hematuria | 14 (24.5%) |
| Acute urinary retention | 7 (12.2%) |

Stones size was from 5mm to 25mm with mean size 16±5.4 mm. The average operating time was 28.12±9.44 minutes with a range of 15 to 45minutes. 41 (71.9%) patients had no complication.

Dysuria was most common complication and was seen in 6 (10.5%) patients which settled by conservative measures. Self-limiting hematuria developed in 4 (7%) patients. Difficulty in passing urine and Fever was observed in 3 (5.3%), 2 (3.5%) patients respectively which was managed by antibiotics and analgesics. Acute urinary retention was seen in 1 (1.8%) patient due to an impacted stone fragment at the external urinary meatus following removal of Foley catheter on first post-operative day which was managed by meatotomy under local anaesthesia and patient was discharged the same day. (Table-II)

**Table-II: Frequency of Post op complications (N=16)**

| Post op complications | Number of patients |
|---|---|
| Dysuria | 6 (10.5%) |
| Mild Hematuria | 4 (7%) |
| Difficulty in passing urine | 3 (5.3%) |
| Fever | 2 (3.5%) |
| Acute urinary retention | 1 (1.8%) |

In 2 (3.5%) patients stone was not successfully fragmented and an open cystolithotomy was performed. 55(96.4%) patients were discharged on the first post-operative day and 2 (3.5%) patients were discharged on the 3 post-operative day on account of cystolithotomy. Mean hospital stay was 1.05±0.225 days

## DISCUSSION

The standard of care for pediatric male patients with bladder stone is transurethral laser stone fragmentation in the developed world while in the developing countries the conventional treatment of vesicolithotomy is still in practice[8]. Economic restraints and the will to provide less invasive yet safe and effective treatment to these young patients has led urologists to explore the non conventional treatment method of using a semirigid ureteroreoscope tranurethrally with pneumatic lithotripsy of vesical stones.

In the present study, common symptoms at presentation were difficulty in passing urine in 68.4%, dysuria in 61.4%, lower urinary tract symptoms in 26.3%, hematuria in 24.5% and acute urinary retention in 12.2%. These symptoms are comparable to other similar studies in the literature[6,11-14].

In our study dysuria was the most common complication observed in 10.5 % patients. Ali et al[11] and Khosa et al[6] reported dysuria in 4.2% and 4% cases post pneumatic lithotripsy respectively. A relatively higher frequency in our series may in part be that all our patients were male while their studies included female patients as well. In females due to short urethra passage of residual fragments is relatively less bothersome as compared to males. Secondly, our patients were relatively older with mean age of 7.7 years whereas their patients were younger with mean age of 6.2 and 5 years respectively. Older children may have a low threshold for symptom description. Shaikh et el[12] in their study on 500 pediatric patients did not report any dysuria because they removed all the stone fragments using ellick evacuator and 8Fr pediatric cystoscope with angled eye piece and ensured removal of all stone fragments doing a repeat cystoscopy. However their technique needed urethral dilatation that led to urethral stricture in 3% of patients.

Mild self limiting hematuria was observed in 4% of our patients postoperatively, which is comparable to other studies across Pakistan[6,11] and abroad[13] Factors responsible for this hematuria may be inflamed bladder mucosa and collateral mucosal injury during striking of pneumatic probe on stone.

Post op acute urinary retention was observed in 1.8% patients due to an impacted stone fragment at the external urinary meatus. Akmal et al[14] reported 5% urethral stone impaction in their series of 40 patients requiring a suprapubic cystostomy and a redo cystolithotripsy. Isen and colleagues[13] also reported AUR in 7.4% patients in a series of 27 male pediatric patients. Similarly Kareem and Abd[15] reported acute urinary retention in 2.5% cases in their series of 40 children. Urethral stone impaction can be prevented by meticulous intra operative stone fragmentation and removal as has been described by Shaikh et al[12.] Low grade 100°F fever was observed in 3.5% cases in our series. This was due to anaesthesia realated respiratory complication. Shaikh at el[12] and Isen [13] have reported similar fever in 3.5% and 7.45% cases respectively. Non of our patients had febrile urinary tract infection as reported by Ali et al[11] in 2.5% of their patients.

Difficulty in passing urine because of passage of relatively larger stone fragments was observed in 5.3% cases in our study. Similar results have been reported by Khosa et al[6]. this is in contrast to the study by Shaikh et al[12] because they ensured the removal of all stone fragments per operatively.

In our series 96.4% stones were successfully fragmented. Ali et al[11] and Akmal et al[14] reported 97.5% and 90% success respectively. Whereas Shaikh et al[12] at al and Khosa et al[6] report 100% success using pneumatic cytolithotripsy for stone fragmentation.

Mean operating time in our study was 28.12 minutes. Similar results have been reported by other studies using transurethral pneumatic lithotripsy where Khosa et al[6], Liaqat et al[11], report 25, 27.5 minutes. Another study with a sample size of 500 patients conducted by Shaikh et al[12] reported 25 in group I (stone size < 2cm) and 45 in group II (stone size 2 to 3 cm) minutes respectively. Isen et al[13] from Turkey reported the mean operating time of 22 minutes in their series of 27 patients.

Our duration of hospital stay was 1.05 days which is comparable to other studies using the same treatment modality for vesical calculi in children[11-14].

The standard treatment of pediatric vesical calculi in developed world is transurethral lithotripsy using laser energy. 100% success with negligible morbidity has been reported in by Ramakrishnan et al[16,17] and Aboulela et al[18] . Jawanmard et al[19] retrospectively compared open cystolitomy, percutanoeous cystolithotomy and transurethral cystolitjotripsy with Holmium-YAG Laser in their series of 159 pediartic patients and concluded that laser lithotripsy was minimally invasive and had high success rate . However, Low health care budget and high cost of laser makes it's availability difficult in the developing world.

Our study shows that transurethral intracorporeal lithotripsy with pneumatic lithoclast using semi rigid ureterorenoscope is a safe and effective procedure with negligible complications and excellent stone free rates in paediatric male patients with stone size of up to 25mm.

## CONCLUSION

Transurethral pneumatic lithotripsy using semi rigid ureterorenoscope is a safe and effective modality in the treatment of bladder calculi up to 25mm in pediatric male patients.

## CONTRIBUTION OF AUTHORS

Masood A: Manuscript writing, Literature review, Designed research methodology.
Khan IZ: Manuscript writing, Literature search
Farouk K: Conceived idea, Manuscript writing.
Nisar H: Statistical analysis.
Ijaz R: Manuscript writing.
Ishtiaq S: Data collection
Taimur M: Manuscript writing

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