ORIGINAL ARTICLE

Pediatric Urethro-Cystolitholapaxy: Application of adults ureterorenoscope for the management of pediatric impacted urethral and vesical stones

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Abstract

Objective: In the scenario where our forty four million population is in pediatric age group, and endoscopic instruments designed for children are not commonly available, we conduct this study to highlight the possibility of effective use of adult size Ureterorenoscope and Pneumatic Lithoclast in pediatric population having urethral and vesical stones.

Study design: Experimental clinical practice study

Study duration: Eighteen months

Methods: In this study we managed fifty cases of pediatric lower tract urinary stones in a government hospital. Children having up to two centimeters urethral or vesical stones were included in this study. All cases were treated endoscopically via adult size Ureterorenoscope and Pneumatic Lithoclast.

Pre-decided safety and efficacy parameters were recorded and discussed. SPSS version 17 was used for Statistical analysis. Fisher exact test and student's t-test were done for categorical and continuous variables respectively. Modified Clavien classification was used for complication assessment.

Results: Of the 50 children's, 21(42%) had impacted urethral and 29(58%) had vesical stones. Age range was 8 to 72 months. Average procedure duration was 40 minutes. All cases were completed successfully and no operative trauma was reported. Stone clearance after first surgery was 98 percent. Average duration of post-operative indwelling urethral catheter was 18 hours. Twelve percent patients had mild hematuria. All except one was discharged within 24 hours of surgery without urethral catheter.

Conclusion: In careful hands adult Ureterorenoscope with Pneumatic Lithoclast can be effectively used in pediatric population. Its efficacy and safety matches the procedure outcome as in both adult and pediatric group where specialized appropriate size instruments were used.

Keywords: Lower tract stones, urethral stones, vesical stones, Ureterorenoscope, Lithoclast, residual stone, urinary tract infection, urethral trauma, and pediatric population

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Introduction:

An impacted urethral or vesical stones in pediatric population is a challenging scenario, which observed frequently in our outpatient and emergency departments.[1,2] Largely such patients were still treated by pushing it back in to the bladder followed by cystolithotomy[3,4,5] or even by urethrolithotomy.[6]

With widely acknowledged endoscopic approach, cystolitholepaxy is now the standard for manage such patients. Less trauma, less pain, early recovery and short hospital stay are the main paybacks recognition for endoscopic treatment[7,8,9]

Along with surgical skills, availability of the pediatric endoscopic instruments is mandatory for practicing urology in a professional manner. In our country pediatric population is about twenty two percent of the total population, which reflect the high turnover of the pediatric patients in health care centers.[10] In the present health budget, demand for expensive pediatric

endoscopic instrument in government, public sector hospital and practicing current endourology is extremely challenging. In circumstances like this, options left for us were, either to refer them to a private hospital, or to offer them open surgical procedures.

In private sector, except in few big cities, pediatric endourology instrument are not commonly available. On availability their cost is not affordable for majority of our poor population. In public hospitals, such equipped pediatric urology units are very few in number therefore they have a long waiting list that sometimes extend to few months. In order to cope with this scenario, in this experimental study without spending extra budget and capital investment we used adult Ureterorenoscope as pediatric urethro-cystoscope to fragment impacted stones by pneumatic lithoclast. The extra length of the instrument, designed for adult patients demands more cautious and skilled approach. By adopting this modification one can offer the best method of treatment to their deprived population without extra economical load to the health department.

Material and Methods:

It is an experimental study, conducted at author unit which is a public sector, city district teaching hospital, with all major treatment modalities for adult urinary stone disease. Duration of study was 18 months, from January 2010 to June 2011. After departmental permission and informed consents from parents, fifty cases were included in this case series. Patients of either gender, having up to two centimeters of urethral or vesical stones were included. Age limit of patients was six years. Basic patient's workup includes history, physical examination, serum hematology, biochemistry, urine detailed report and culture sensitivity. Ultrasound and plain X-ray kidney ureter and bladder (KUB) was our essential radiological investigations. Stone size was measured by ultrasound.[11,12] Intravenous Urogram (IVU), CT Pyelogram and Ascending Urethrogram were optional and reserved for specific circumstances.

Patients having persistent urinary tract infection, renal failure, upper urinary tract stones and lower tract structural abnormalities were excluded. Similarly those cases identified as high risk for general anesthesia were also excluded.

All cases were operated by same surgeon. Instead of using pediatric instrument, we used adult semi rigid ureterorenoscope (URS) size 8 Fr. as pediatric cystourethroscope. Swiss Pneumatic Lithoclast (PLC) was used to fragment stones. Introduction of the long URS in children's short, fragile, and narrow urethra demands more skilled and gentle handling, particularly when surgeon tries to negotiate posterior urethra and bladder neck. In early cases we used to push urethral stones back into the bladder under vision and then applied lithoclast. But via using pneumatic energy, physical oscillation moves stones and it is difficult to fragment them effectively and quickly. Applying lithoclast when stones are impacted in the urethra or bladder neck is more effective. Similarly while applying Pneumatic Lithoclast for vesical stone we keep bladder half-filled with minimum water irrigation. Both these measures help in quick stone fragmentation.

Stone gravels were evacuated by Ellick evacuator. For any size-able residual stones fragments check cystoscopy was performed in the end. Indwelling urethral catheter was placed in all cases. Next morning X- ray KUB was performed, catheter removed and patients were discharged on oral medications.

Procedure safety was assessed by average duration of procedure, procedure failure, on table trauma report to meatus, urethra or bladder, post-operative hematuria, fever and extended hospital stay for more than three days. Hematuria is a common observation in all therapeutic transurethral procedures. In majority it is self-controlled in few hours (mild), at time it may needs bladder irrigation (moderate) or even blood transfusion or relook Cystoscopy (severe). Long term safety was assessed by extended follow up at 3, 6 and 12 months to rule out urethral stricture disease secondary to operative trauma. Efficacy of procedure was estimated via duration of procedure, procedure failure, stone

Table 1:Procedure Safety Parameters

Safety variables	Result n=50
Procedure duration in minutes. Range (mean + SD)	20-58 (40 ± 07)
On table trauma report	Nil
Procedure Failure	Nil
Post-Operative mild hematuria	06 (12 %)
Post-Operative fever (low grade)	11 (22 %)
Post-operative hospitals stay in hours. Range (mean + SD)	12-36 (20 ± 04)

Table 2:Procedure Efficacy Parameters

Efficacy variables	Result n=50
Procedure duration in minutes. Range (mean + SD)	20-58 (40 ± 07)
Residual stones	01 (02%)
Repeat procedure	01 (02%)
Post-operative catheter duration in hours. Range (mean + SD)	10-24 (20 ± 02)

clearance, residual stones, and number of repeated procedures.

Statistical analysis was performed with SPSS software (SPSS: An IBM company, version 17, IBM Corporation, Armonk, New York, USA). The values were expressed as mean + standard deviation (SD). Analysis of categorical variables was done using fisher exact test while continuous data was evaluated by student's t-test. ($p<0.05$) was taken as significant. Modified Clavien classification was used for complication assessment.

Results:

In 18 months, fifty children were operated in this study. Out of these 34 (68%) were boys. 21 patients (42%) had impacted proximal urethral stones and 29 (58%) had vesical stones. Average age was 3 years with range from 8 months to 6 years. On presentation 27 children's (54%) were in retention and catheterized before definite treatment (16 had urethral catheter and 11 had suprapubic catheterization by 4 Fr. Feeding tube). Initial urine culture was positive in 34% children's. All infected cases were treated with antibiotics for five days before procedure. Average stone size was 1.2 cm with range of 0.8 to 2 cm and SD of 0.3 cm. Average duration of procedure was 40 minutes and post-operative indwelling catheter duration was 20 hours. One patient required repeat procedure because of size-able residual stone. There was no incidence of meatal, urethral or bladder injury. Eleven patients developed low grade fever and 6 had self-controlled, short duration mild hematuria in post-operative period.

Compliance for follow up in post- operative clinics is very disappointing in our patients, however, in the observed percentage of patients, no one was found to have clinical urethral stricture disease.

Discussion:

Urinary stone disease is a common health issue all over the world.[13] With increases in the prevalence of obesity[14] and diabetes,[15] the incidence of urinary stone disease is also rising[16-18]. In this era with a better understanding of stone disease, and availability of epidemiological data of population effected, the mandatory steps to cope up this load is to upgrading of existing urology units, increase in number of endourology centers and adopting standard protocols to serve population in an effective and quick approach. High prevalence of stones disease, not only impact badly on patient's functional capability and renal health but also to the economy of the country and health budget. Only in USA the estimated urolithiasis related treatment expenditure is about $a2.1 billion in year 2000[19,20]. As a principle of economy, quality work and capital investment runs site by site.[21] In order to made quality work more affordable, adaptation and variation can be made in an established algorithm provided that it is not against the basic principle, it is effective and results are comparable to standards.

UNICEF mentioned a significant high birth rate in our country. This fact is reflected by our forty four million population is in pediatric age group (22%). It means at least every one in five patients are in pediatric age group. From basic immunization to advance surgical treatment the health facilities for them are very much overlooked. Pediatrics surgical units are very less in number, having limited man power and resources so they were mostly practice in an old fashion. The same scenario was in author's hospital. Though it's a teaching hospital in public sector, the pediatric urology unit does not exist.

In 2008, because of enormous patient's turnover with urinary stone disease, our unit was upgraded with extracorporeal lithotripter, Ureterorenoscope and pneumatic lithoclast for treatment of adult stone disease. Amusingly instead of clearing our stone load, it became almost doubled in next two years. Though we worked as an adult urological unit, the pediatric patient's turnover was also increased. Because a well-equipped public sector pediatric hospitals are not commonly existing to cop up the population requirement and the operating cost in a private hospital would be around 700-1000 US dollars, referrals them to other hospitals is not justifiable. The options left for us are to continue open surgery or to demand new pediatric endoscope that is a very lengthy tract with extra financial burden on our health system.

Pediatrics' Cystolitholepaxy is an established standard method of treating in such cases.[22-27] Our interest of conducting this study was because of the high number of pediatric patients we have, and our limitation was absence of appropriate size instruments. In this circumstances for a better and less invasive treatment we modify the use of our adult therapeutic tools i.e. URS. Since last two decade the safety and efficacy of URS and Swiss lithoclast is time tested.[28-32] The diameter of adult URS is similar to the diameter of pediatric cystoscope but there is a gross disparity in its length. Essentially instrument diameter and length are two important considerations for selecting them in any group of patients. Particularly the diameter, as if we try to pass large diameter instrument through narrow tract it may causes stretch injury to mucosa, leads to postoperative hematuria, scaring, fibrosis and later-on chances of stricture formation. Length discrepancy raised the query of procedure safety while using in pediatric population. Hypothetically there is additional probability of trauma at urethral meatus and at bladder neck, but our results proof that procedure outcome is in majority based on operator's skilled hands. In literature review trauma incidence were reported in both groups of patients, but there incidence vary and all based upon operator and its experience.[33-35] International data shows that trauma incidence of Cystolitholepaxy in both adult and pediatric patients are not very different.[36] When we compared our results of modified use of instrument in such cases it is compatible with previous study by Thomas and many more.

Hematuria and fever after transurethral procedures is a common observation. Mucosal laceration and pre-existing urinary tract infection were considered as its main causes.[37,38] In our study 54 percent cases were already been catheterized before surgery and almost all belongs to poor socioeconomical group. Out of those patients who were catheterized before, 9 which is eighteen percent of study group had postoperative fever and mild hematuria. Deprived nutritional status urinary stones, indwelling catheter are all known factors that leads to infection. Therefore a relatively significant post-operative incidence of fever is not operative technique based. However we may further reduce it with better preoperative measures and strict inclusion criteria.

Following operative trauma to urethra, the most horrendous consideration is stricture to urethra.[39] To avoid such complications it is essential to have a good and comprehensive pre-operative evaluation, suitable selection and handling of instrument, avoiding use of force or push during surgery, and to remove catheter as soon as possible. Long term follow up of our study cases excludes any incidence of clinical stricture disease after average of two years duration.

Conclusions:

It is ideal to use instrument appropriate to the patient's size and age. In a poor country, to offer standard treatment and to make treatment more cost effective, few modifications can be justifiable. The adult size URS with pneumatic lithoclast is a safe and effective tool to treat urethral and vesical stones in pediatric population.

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Role and contribution of authors:

Dr Syed Saeed Abidi, collected the data, and references and wrote the article and gave the final touchup.

Dr Irfan Feroz, helped in collecting the data and references

Dr Owais Khawar, collected the dat and helped in introduction writingcvv

Dr Saquib U. Khan, collected the data and helped in discussion writing

Dr Mohammad Aslam, collected the data and references.

Dr Hamid Ali also helped in collecting the data and helped in writing the results, conclusion and discussion.

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