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ORIGINAL ARTICLE

SURGICAL MANAGEMENT OF URINARY TRACT STONES IN CHILDREN:EXPERIENCE FROM TIKURANBESSA HOSPITAL, ADDIS ABABA, ETHIOPIA

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ABSTRACT

Introduction*: Urinary stone disease is a disorder with significant impact on quality of life. Moreover, children have a higher recurrence rate owing to associated metabolic and anatomic abnormalities. Management has changed with technological advances. Despite the current trend, open stone surgery is still widely practiced in developing countries. However, there have been no reports regarding treatment of this disease in children from Ethiopia so far. We aimed to determine the mode of management and outcomes of the différent approches for childhood urolithiasis which practiced in our institution. We also tried to assess factors leading to adverse outcomes.*

Methods: *This is a retrospective descriptive study of pediatric patients who underwent surgical procedures for urolithias from September 2010 to August 2015. Medical records were reviewed for factors thought to affect outcome of management.*

Results*: We investigated 50 children aged 0-15 years and the mean age for operation was 8.5 ± 3.2 years. The stones were found exclusively in upper urinary tract in 56%, lower urinary tract in 30% and a combination of sites in 14%. All lower urinary tract stones were managed with open surgery, of which cystolithotomy comprised 81%. Common procedures performed for upper urinary tract stones were open stone surgery (41 %) and ureteroscopic intervention in (34.5%). Success rate with ureteroscopy was 30%. Post-operative complications occurred in 24%; common ones being urinary tract infection (10%) and urinary leak (10%). The factors with significant correlation to post-operative complications were history of urinary tract infection and chronic kidney disease (p=0.02 and p=0.047 respectively). Recurrence occurred in 12%. Thirty percent of the children required a second surgical procedure.*

Conclusion: *The practice in our institution is still evolving towards the standard approaches of stone treatment. Metabolic evaluation is lacking, post-operative complications are high and our experience with pediatric ureteroscopy was not satisfactory. Most of these issues were associated with our socioeconomic status, as facility was not adequately equipped and patients presented late with renal failure.*

Keywords*: Pediatric urolithiasis, Stone disease in Ethiopia*

INTRODUCTION

Urolithiasis is an important problem in the pediatric population of developing nations. Although there is no well compiled data so far, the reported incidence is higher than developed countries (1–4). In a hospital based study in Ethiopia, about half of urolithiasis cases occurred in the ages 0-19 years (5). Children living in endemic areas also have a tendency to form stones in the bladder (2,3,6). This phenomenon, which is thought to be associated with malnutrition, has been described in our country as well (6,7).

Therapeutic options for urinary stones depend on the location, size and composition of the calculus among other factors (8). Current management includes newer methods such as ureterorenoscopy (URS), Extracorporeal shockwave llithotripsy (ESWL) and percutaneous nephrolithotomy (PCNL). These less invasive modalities have been shown to greatly reduce morbidity, mortality and period of hospitalization. (9,10) Nowadays the role of open stone surgery is diminished, being practiced mostly for cases with anatomic abnormalities and complex calculi (11). Nonetheless, it is still among the first-line therapies in developing countries as it is necessitated by lack of infrastructure and the presence of neglected, large, complex stones. It is also commonly performed for patients residing far away from tertiary centers and are unable to afford multiple visits (12).

Studies on urinary tract stones in Ethiopia are scarce. To the best of our knowledge, there are only two publications on pediatric stone disease. Johnson's series, conducted two decades back, was the first report on childhood bladder stones (7). He confirmed the presence of endemic stones, although with lower incidence in comparison to other African countries. More recently, Metaferia et al. reviewed the epidemiology and risk factors for childhood urolithiasis(13). However, there have been no studies on management of childhood urinary tract stones up until now. This study is the first in our country to evaluate the outcome of surgical treatment in pediatric urolithiasis.

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PATIENTS AND METHODS

This is a hospital based retrospective study conducted in a 5-year period (from September 2010 to August 2015) at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia. This hospital is the largest tertiary care center and teaching hospital in the country with nearly 2000 pediatric surgical procedures being performed yearly. We examined the data of children less than 15 years of age who were managed surgically for urolithiasis. Operating theater logbooks were used to identify patients. Out of the 62 children we found, 12 were excluded from the study because of missing records.

Information was obtained from medical records and through telephone interviews using a pre-tested questionnaire. Variables included were demographics of the patients, stone description, risk factors for stone formation, risk factors for post-operative complications, hospital admission details, operative details and outcome.

Data was then entered, cleaned, coded and analyzed using SPSS version 23. Statistical analysis was performed using chi-square test and P value <0.05 was considered significant. The study was approved by the research committee of the department of surgery at Addis Ababa University, college of health sciences.

RESULTS

A total of 50 children aged 0-15 years (mean age of 8.5 ± 3.2 years) underwent surgical procedures for urolithiasis. There were 40 boys (80%) and 10 girls (20%). 56% had stones exclusively in the upper urinary tract, 30% in lower urinary tract and 14% in both. A total of 35 patients (70%) had upper tract stone with 52% being unilateral (32% left and 20% right) and 18% bilateral. Most of the patients came from outside of Addis Ababa (62%). Mean follow-up time was 3 ± 1.4 years. (Table 1)

Table 1. Comparison of background characteristics with studies in other countries, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2010-2015

	Our Study (2017)	India (2010)	UK (2000)
Study period	2010-2015	2004-2008	1997-1999
Sample	50 children	3053 children	59 children
Age (mean)	Up to 15yr (8.5 ± 3.2 yr)	Up to 15yr (6.35 ±3.7 yr)	Up to 16yr (6.4 - 7.4 yr)
Sex (M:F)	4:1	2.8 : 1	1.4:1
Stone Location	56% /30%	81%/19%	Upper
Stone Size	1.54 ± 1.13 cm	5.05 ± 5.88 cm (kidney) 1.95 ±1.33 cm (ureter) 7.6 ± 3.2 cm (bladder)	0.8 cm

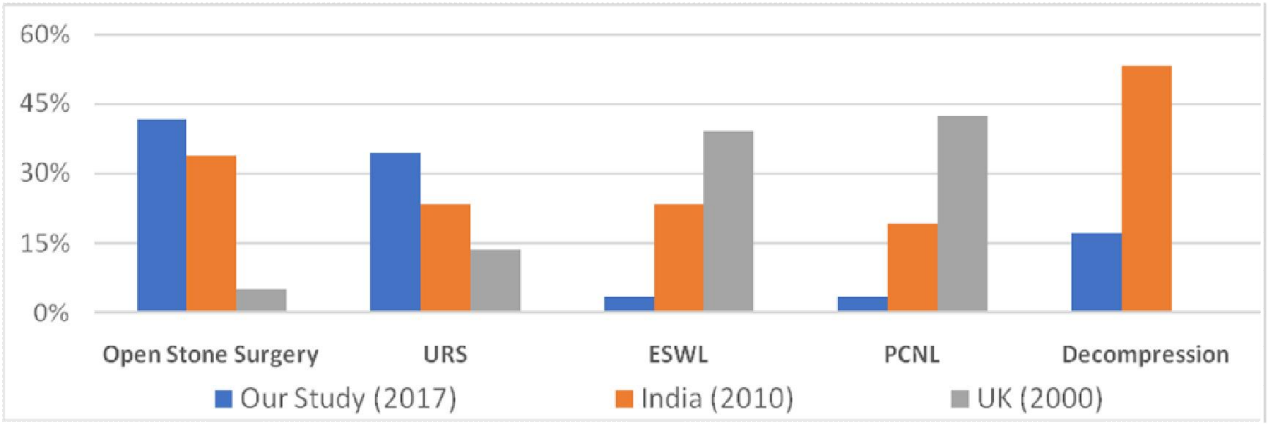

Figure 1. Comparison of procedures performed for upper tract stones with studies in other countries, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2010-2015

Recurrent UTI was the most commonly identified predisposing factor for stone formation, occurring in 22% of the patients, followed by genitourinary anatomic abnormalities (14%). There was only one child with history of previous stone and one with a family history of stone disease. On urinalysis, acidic pH < 6 was found in 54% of the patients while only 6% had alkaline pH >7.

Mean operative time was 58.8 ± 30.5 minutes and mean post-operative hospital stay was 11.4 ± 13.2 days. There was no significant difference between the different procedures in terms of operative time and post-operative hospital stay (p=0.14 and p=0.06 respectively). There was no significant difference in the choice of procedure amongst the different age groups (p=0.42).

All procedures for lower urinary tract stones were open surgeries. The most common one is cystolithotomy which was done for 17 children (81 %). Most frequently carried out procedure for upper urinary tract stones was open surgery in 12 patients (41.4%) followed by ureteroscopy in 10 (34.5%). Five children (17.2%) required emergency decompression with either a stent or nephrostomy. Percutaneous nephrostomy was performed in one child as was PCNL. ESWL was done for a single patient as well. (Fig. 1)

Stone removal rate was 84%. The PCNL was successful but the ESWL was not. Open stone surgery had a success rate of 100% while ureteroscopy had 30%. URS failures were due to stone migration in 3 patients (30%), failure to cannulate ureteric orifice (after it was visualized) in 2 patients (20%), and failure to fragment stone because of malfunction of intracorporeal lithotripter in 2 patients (20%). 20 % of the URS were converted to open surgery and 50% required a second surgery.

52% had a single stone while 48% had more than one. Stone size ranged from 4mm to 50 mm and the mean was 15.6 ± 11.2 mm. Larger stones were located in the lower urinary tract (P=0.02). Stone analysis was done only for 4 patients of whom 2 showed calcium oxalate, 1 calcium non-oxalate and 1 ammonium. Four children (8%) underwent metabolic screening with serum PTH, uric acid and phosphate but none were submitted to a urine metabolic study. No abnormalities were detected.

Post-operative complications occurred in 24%. (Table. 2). The most frequent post-operative complications were urinary tract infection (10%) and urinary leak (10%). (Table. 2) There was one in hospital death, which occurred 5 days after ureterolithotomy in a patient with end stage renal disease. There were no late deaths. None had stricture or perforation.

Pre-operative risk factors identified were pre-operative urinary tract infection (UTI) in 26%, renal failure in 20% (10% AKI and 10% CKD), hypertension in 10%, hyperkalemia in 8% and malnutrition 8%. The factors with significant association to post-operative complications were history of UTI and chronic renal failure (p=0.02 and p=0.047 respectively). There was no significant difference between the procedures in development of post-operative urinary tract infection (p=0.08).

30% of the children required a second surgical procedure. Reasons for the second procedure were failure of first procedure (12%), recurrence (8%), definitive surgery after prior decompression (6%) and for a pre-existing contralateral stone (4%). 3 children (6%) required a third surgery for recurrent stones.

Recurrence occurred in 12%. (Table. 2) Timing of recurrence was 47.1 ± 41.9 weeks after procedure. Of the 6 children who developed recurrence, all but 1 required surgical intervention. Recurrence rate was not significantly associated with recurrent UTI (p= 0.6), urine pH (p=0.64) or presence of anatomic abnormalities (p=0.38). One child passed the stone spontaneously. Two of the children developed a second recurrence.

Table 2. Comparison of outcome of surgery with studies in other countries, Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2010-2015

	Our Study (2017)	India (2010)	UK (2000)
Success rate	84%	94%	88% - 97%
-URS	30%	96%	4/8
-Open	100%	91-100%	2/3
Hospital stay (post op)	11.4 ± 13.2 days	4.3 $\pm$ 2.8 days	2days, 4.8 days
Complications	24%	-	-
- Leak	10%	5% +	
- Infection	10%	4.1% +	
- Death	2%	-	
Recurrence	12%		

DISCUSSION

There has been a radical change in the management of pediatric urolithiasis over the past decades. Technological advances have led to the emergence of minimally invasive surgery (MIS), which are currently accepted as first line treatment (9–11). In developed countries more than 95% of patients are treated by MIS but open surgery still retains its importance in developing countries (9,11,14). This may be a result of high burden of the disease in addition to many patients presenting with large or multiple stones in renal failure (12).

Our study included 50 children with a male to female ratio of 4:1 and mean age of 8.5 ± 3.2 years which is higher than elsewhere in the world (12,14).Our mean stone size was also higher which may be attributed to the higher prevalence of lower tract stones which tend to be of larger size (p=0.02).

We found out that 66% of our cases had open surgery, which is 2-3 times higher when compared to other developing countries.(12,15) This is mainly attributed to poor pediatric urologic facilities. ESWL not being widely available also resulted in a higher rate of open procedures. PCNL was not considered in most children as well, because of the un-availability of appropriate sized-nephroscopes. In addition, absence of equipment for percutaneous and perurethral cystolithotripsy resulted in all lower urinary tract stones being managed with open procedures. The percentage of open surgery for upper tract stones is lower (41%) due to the use of ureteroscopy.

However, the rate of minimally invasive procedures, including uretrosopy, is still low compared with the other studies (12,14). Furthermore, there was a low success rate with ureteroscopy (30%), necessitating a second open surgery and leading to longer hospital stay. Cephalad migration of ureteral calculi accounts for a high percent of uretroscopy failures. (16) This was true in our study as well with stone migration occurring in 30%. However, other reasons for failure (40%) were due to lack of equipment like smaller scopes, dilators or lithotripter.

Syed A. Rizviet. al. reported social reasons being the main reason open surgeries are preferred.(12) Although the indication for choosing the procedures was not documented, this might also be the case in our study. At least we can observe we had patients with large bladder stones (66%), most came from far away (62 % outside of Addis Ababa) and some had chronic failure on initial presentation (10%).

The rate of post-operative complications was also found to be high (24%). Of the risk factors we analyzed, we found significant association of post-operative complication with history of UTI and chronic kidney disease. We could not, however, find an association with open surgery which is known to have a greater morbidity (12). This is likely explained by lower number of patients which underwent MIS.

Although it is still not clear whether urinary tract infection is a risk factor or a complication of stones, it is a commonly associated finding, reported in 14-37% as is the case of our study (38%) (15,17). It is also reported about 14% of children have genitourinary abnormalities, which coincides with our observation.(4,15) However, we did not find significant association between these risk factors and recurrent disease.

Lamo M et al. reported 5 year recurrence rates for children who required surgical intervention to be high (55%), more so in those with anatomic abnormalities. (17) In our study the recurrence rate was lower (24%). However, our mean follow-up time was shorter (3 ± 1.4 years) and recurrence could have been higher given a longer follow-up.

There were important limitations to our study because of its design. As it is retrospective, the data we obtained was confined to incomplete records. Reasons for choosing a modality of treatment was not documented and stone analysis was found in four patients only.

Conclusion: In our report, we have observed a higher rate of post-operative complications, and these are mainly associated to children with UTI and chronic renal failure. There was also a high recurrence rate. While open surgery is the first line option of treatment, our use of ureteroscopy is encouraging. However, our experience with URS, ESWL and PCNL was not as satisfactory. We believe improving our faculty in terms of equipment and expertise would be key in addressing these issues.

Although this study gives a better understanding of the management of stone diseases in Ethiopian children, it had certain limitations and we believe a further long term prospective study is required in this regard.

Conflicts of Interest: None to declare

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