

## Adherence to Hippocratic Oath in the Treatment of Urinary Tract Stones by Minimally Invasive Surgery; A five Years Experience in Dar es Salaam, Tanzania.

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**Background:** *Minimally invasive treatment – (referring to endoscopic, laparoscopic and shockwave procedures) have made open surgery for stones nearly obsolete hence adhering to the father's of medicine that not to provide treatments which are pointless or harmful. The development of shock wave lithotripsy, percutaneous nephrolithotomy techniques and intracorporeal lithotripsy devices has conferred unprecedented management tools for upper tract stones. With experience, successful stone retrieval has occurred in upwards of 90% of cases, again with minimal complications. Moreover, transfusion rates, hospital costs, and convalescence periods have been markedly reduced when compared to open surgery.*

**Objective:** *This study aimed to document the profile and outcome of patients treated for urinary tract stones by minimally invasive approach at Apollo Medical Centre – Dar-es-salaam, for five years being an experience in a typical third world environment.*

**Methods:** *This was a five years hospital based descriptive, combined retrospective and prospective study conducted by using a structured data collecting tool. The data were analyzed using SPSS software.*

**Results:** *A total of 281 patients treated for urinary tract stones by minimally invasive approach in a period of five years were enrolled, of which 204 were retrospective, and 77 patients were prospective. Males were the majority at 66.9% (188) giving M:F ratio of 2:1. Majority of the patients, 274 (80%) were over 30 years of age. Renal stones were the commonest at 45.5% with ESWL being the most popular procedure performed in 47.7% of all patients. ESWL had a success rate of 70.7%, lower than contact lithotripsy and forceps picking. Only 4.6% complication rate was reported, both being minor.*

**Conclusions:** *the prevalence of urinary tract stones is increasing among female. Our patients deserve the benefits of minimally invasive techniques in the management of urolithiasis as they have been demonstrated to be feasible, safe and ESWL non-technically demanding.*

**Key words;** Minimal invasive treatment, Urinary stones, Complications, Success

### Introduction

Stone disease has afflicted humans since antiquity thus why it was mentioned in the Hippocratic Oath, but the true prevalence of the disease in Tanzania and developing countries as a whole is lacking. It has also seen an evolution from open surgical techniques, associated with significant morbidity and sometimes mortality, to less invasive options which include endoscopy, laparoscopy and shockwave procedures. While this shift in the management has taken root in developed countries, very few centers in developing countries have added them into their armamentarium; in Tanzania, with a population of nearly fifty million people only one centre offers the less and non-invasive options. Current USA data shows a 37% increase in prevalence over 18 years (1976-1980 to 1988-1994), the same might be true in Tanzania as well given the change in lifestyle. Studies have also shown that the disease is also increasing faster among women<sup>1-6</sup>.

Urolithiasis is generally said to be rare among Africans though detailed studies of the condition are few in our region. A two 2 years prospective study by Mkony<sup>7</sup> in Tanzania, 1993, had identified 77 adult patients with urinary stones with males being affected 3 times more commonly than females and most patients were in the young productive age group. All the patients underwent open surgery, with others ending up with a nephrectomy. Available evidence suggests stone disease is increasing across all age groups; approximately 12% of men and 6% of women will experience symptomatic kidney stone in their lifetime.<sup>8</sup> The disease peaks in the most productive age group at 20-50 years of

age and remains rare in those less than 10 years old.<sup>9</sup> Studies from African Americans are more likely to have stone disease, with 'stone belt' identified in temperate, sunlight and beverage consumption.<sup>10-11</sup> This might be similar to our own environment in the tropics.

Management of urinary calculus disease has changed dramatically in the past two decades. Minimally invasive options have made open stone surgery nearly obsolete. The development of shock wave lithotripsy, percutaneous nephrolithotomy techniques and intracorporeal lithotripsy devices has conferred unprecedented management tools for upper tract stones.<sup>12</sup> Moreover, transfusion rates, hospital costs, and convalescence periods have been markedly reduced when compared to open surgery. Likewise, the advent of fiberoptic technology has resulted in miniaturization of ureteroscopes making access to the entire collecting tract possible from either a retrograde or antegrade approach. With experience, successful stone retrieval has occurred in upwards of 90% of cases, again with minimally complications.<sup>13-14</sup>

The subspecialty of Endourology has emerged over the past 20 years and significantly changed the management of urinary tract calculi within this short period of time. Further advancements in shock wave and laser technology, training modules and the development of more durable endoscopes may prove beneficial in providing even better stone treatments with a reduction in morbidity<sup>12-14</sup>. ESWL is the least invasive modality for definitive stone treatment but provides a lower stone-free rate than other more invasive treatment methods, such as ureteroscopic manipulation with laser lithotripsy or percutaneous nephrolithotomy (PCNL). The passage of stone fragments may take a few days or a week and may cause mild pain. Patients may be instructed to drink as much water as practical during this time. Patients are also advised to void through a stone screen in order to capture stone fragments for analysis<sup>15</sup>.

A study by Fraser et al showed that, of 43 children treated with ESWL, 38 (88%) were rendered stone-free, metabolic disorders accounted for three of the five cases of residual calculi. Complications requiring intervention occurred in two children (7%) and three subsequently underwent open pyelolithotomy or ureterolithotomy after unsuccessful minimally invasive treatment.<sup>47</sup> Where new stone formation is a strong possibility because there are metabolic abnormalities or persistent urinary infection, the opportunity to reduce the likelihood of repeated major operations is very attractive.<sup>15-16</sup>

The objective of this study aimed at documenting the profile and outcome of patients treated for urinary tract stones by minimally invasive approach at Apollo Medical Centre – Dar-es-salaam tanzania from Jan 2008- Dec 2012.

## Patients and Methods

This was a descriptive; hospital based combined prospective and retrospective study that evaluated all patients treated for urinary tract stones by minimally invasive approach. This is currently the only hospital offering minimally invasive techniques for upper urinary tract stone.

All patients treated for urinary tract stones by minimally invasive approach at Apollo Medical Centre in Dar-es-salaam from Jan 2008 to Dec 2012 were enrolled. Patient with incomplete information which does not fulfill the requirement of this study were excluded from the study. Ethical clearance was obtained from MUHAS; an approval was sought from the Apollo Medical Centre administration office for the access to the files of all patients treated for urinary tract stones by minimally invasive approach from Jan 2008 to Dec 2012. All patients' information was kept confidential; no patient's direct identifiers were used in the data collection instrument.

A structured questionnaire was used to collect data from patient's case notes. Checking of the questionnaire for completeness was done and the entered into computer for analysis where SPSS version 18 was used to analyze the information. Cross-tabulations were generated, and where comparisons were made, significance was considered at p-value of less than 0.05.

**Study limitations:**

This study was done at Apollo Medical Centre which is a private hospital located in the Centre of Dar es Salaam city, thus the findings may not reflect a true image of the magnitude of urinary system stones in Dar es Salaam and country at large.

**Results**

A total of 281 patients were treated for urinary tract stones by minimally invasive during the study period of five years. Of these, 204 were retrospective and 77 were prospective. Males were the majority at 66.9% (188/281) with a male to female ratio of 2:1. Majority of the patients were 30 years of age or more at 85% (274/281) and the least age group treated was that less than 20 years of age at 2.5% (Table 1).

The ureter was the commonest site for stone with 39.5% (111/281) patients involved followed by renal pelvis by 32.4% (91/281), and upper calyces were the least involved by 2.8% (8/281). Only 2.1% (6) of the patients had stones reported from multiple sites. Of the 281 patients, ESWL was the most performed procedure on 44.7% (134) followed by URS+ Ballistic on 27% (76). ESWL was the preferred procedure for renal stones regardless of position while URS plus ballistic was the preferred procedure for ureteric stones (Table 2)

ESWL had the lowest success rate as primary procedure at 70.8% (95/134) followed by URS plus either ballistic or picking at 90.7% (69/76) and 93.3% (28/30) respectively. The remaining procedures had 100% success rate (Table 3).

Complication rate of 4.6% (13/281) was observed with mucosal tear being the most common at 61.5% (8/13) followed by significant hemorrhage at 30.8% (4/13) and one patient had Ureteric perforation which was repaired by open surgery in the same sitting (Table 4). Most of our patients 255(90.7%) had no post operative complications in the first three days , 18 patients (6.4%) had severe pain postoperatively, 5 patients had post operative hemorrhage and 3 patients (1.1%) reported fever (taken as sign of infection).

**Table 1.** Age and sex distribution of 281 patients treated by minimally invasive surgery

Age group	Sex of patients		Total
	Male	Female	
12-19	2	5	7
20-29	20	15	35
30-39	56	16	72
40-49	52	19	71
≥50	58	38	96
<b>Total</b>	188	93	281

**Table 2.** Association between Stone locations and primary procedure done (n=281)

Stone location	Primary procedure						Total
	ESWL	URS+ Ballistic	URS +Picking	ESWL +Ballistic	Cysto- lithotripsy	Balloon dilation /stenting	
Renal pelvis	82	1	2	1	0	5	91
Lower calyx	14	0	0	0	0	0	14
Middle calyx	17	0	0	0	0	0	17
Upper calyx	8	0	0	0	0	0	8
Ureter	11	67	20	10	0	3	111
Bladder	0	0	0	0	12	0	12
UV junction	0	8	8	2	0	4	22
Multiple sites	2	0	0	4	0	0	6
<b>Total</b>	<b>134</b>	<b>76</b>	<b>30</b>	<b>17</b>	<b>12</b>	<b>12</b>	<b>281</b>

**Table 3.** Primary Procedure success rate

Primary procedure	Total No Performed	Success No	Success Rate
ESWL	134	95	70.8%
URS+Ballistic	76	69	90.7%
URS+Picking	30	28	93.3%
ESWL+Ballistic	17	17	100%
Cystolithotripsy	12	12	100%
Balloon dilatation/ stenting	12	12	100%
<b>Total</b>	<b>281</b>	<b>233</b>	<b>82.9%</b>

**Table 4.** Procedure Complications (n=13)

Intraoperative complication	Frequency	Percent
Mucosal tear	8	61.5%
Hemorrhage	4	30.8%
Ureteric perforation	1	7.7%
<b>Total</b>	<b>13</b>	<b>100%</b>

### Discussion

Our study did not aim at giving the prevalence of urinary tract stone disease in Tanzania so it will still remain unknown. But we have demonstrated some significant demography of patients presenting with stone disease in a single centre in Tanzania. This study found urinary tract stone disease females at increased rate than previously shown by Mkonyet al<sup>7</sup>, 2:1 from 3:1 in 20 years ago. This is similar to what is happening in other parts of the world where a similar trend has been observed<sup>1, 5-6, 17-18</sup>. The factors associated with this change in trend have not been studied locally, but studies elsewhere implicate changes in diet and lifestyle associated with risk factors such as obesity.<sup>8, 10-11</sup> In the Asia parts, there is still a wider gap between male and female involvement with the disease at 5-9:1.<sup>19-21</sup> But generally the old fact remains true that, more men suffer from urolithiasis than do women.<sup>22</sup> Our study shows a progressive increase of stone disease incidence with age similar to findings from other studies. The disease has remained relatively uncommon in children under 10 years of age. It has been found to peak between the ages of 20 to 50<sup>1-2,23</sup>.

The Ureter was the commonest site of stone at diagnosis, with 39.5% of patients having ureteric stones; this reflects to what was found by other studies elsewhere<sup>21, 24-25</sup>. This is slight lower to the findings from a study done in Peshawar which had renal calculi incidence was >60% followed by ureter, bladder and urethra in descending order.<sup>21</sup> These findings directly support the argument that, it is more likely to develop kidney stones as compared to stones in other parts of urinary tract<sup>18</sup>. No lateralization was found in our study, contrary to what was found by Hüsnü<sup>72</sup> that more stones were more in the left 55.7% compared to the right 37.5%. In our study bladder stone was not common 4.3% contrary to what was found in famous studies from Germany 9.1%, Peshawar 16.4%, and sky high Lahore data 47.94% this is probably due to dietary and environmental factors<sup>1, 12, 26</sup>.

This study demonstrated the ESWL is the most performed non-invasive procedure for urolithiasis in our set up similar to other centers.<sup>14-15,27-33</sup> But in case, ESWL was the preferred procedure only for renal stones and not for Ureteric stones unlike reports by Parekattil et al<sup>12</sup> in which it was preferred for both renal and Ureteric stones. But currently this is changing with miniaturization of scopes, advances in the use of laser technology in conjunction with Percutaneous Nephrolithotomy (PCNL) use; more patients are now offered contact lithotripsy regardless of site or size of the stone.

There was low complications rate reported by the surgeons in this study. This could be due to prophylactic procedures like Ureteric stenting and catheterization done in 68% and 13.5% of all the patients respectively. Stenting has been shown to also increase stone free rates being 68.6% versus 83.7% for non-stented patients<sup>34</sup>. On the other hand, stenting was significantly associated with post-treatment lower urinary tract symptoms ( $P \leq 0.001$ ), need for more ESWL sessions ( $P = 0.019$ ) and possibility for reoperation due to ESWL failure ( $P = 0.026$ )<sup>34-35</sup>.

These non-invasive measures in urolithiasis are very effective given their low complications rate even in our settings. By procedure for primary intent, EWSL had lower success rate but was high at 70.8%

compared to contact lithotripsy and forceps picking. These findings are similar to those reported by other researchers<sup>27-28, 31, 33, 35</sup>.

In our study approximately one third of the patients who were treated by ESWL required a more than one session for stone clearance with average of two sessions per patient. However, in almost all patients treated with URS complete stone clearance was achieved at the first sitting. This effectiveness is valid for both kidney and ureteric stones, results which are supported by Siddiqui et al<sup>21</sup> and Yaşar Bozkurt<sup>27</sup>. But ESWL is advised to be considered as the first-line treatment for ureteric stones because of its non-invasive nature, lack of a requirement for general anaesthesia and low complication rates<sup>14, 27-28</sup>. In patients who underwent ESWL only two thirds were stone free after the first attempt. While URS has success rate of more than 90% in the first attempt, this fact also adds to the knowledge from previous studies which reported that “URS has a better success rate than ESWL for first treatment, ESWL often requires repeated sessions and additional procedures including ureteric stent insertion and even URS. But the advantages of ESWL include its noninvasive nature, the fact that it is technically easy to treat most upper urinary tract calculi, and that, at least acutely; it is a well-tolerated, low-morbidity treatment for the vast majority of people<sup>27-28, 34-35</sup>. However, it is recommended to slow the shock wave firing rate from 120 pulses per minute to 60 pulses per minute to reduce the risk of renal injury and increase the degree of stone fragmentation<sup>14</sup>.

This study has demonstrated very low intra operative complication rate in terms of number and magnitude of the complications. Only one major complication occurred which was ureteral perforation and was repaired in the same sitting by open surgery after removal of the stone, thus for 281 patients the complication rate was 4.62%. No mortality attributed to stone treatment was recorded in our study. Several studies also report low rate of ESWL complications<sup>4, 9, 35</sup>, except a study from Kuwait<sup>23</sup> which had a higher complication rate of 15.5%.

In general post-ESWL complication rate proves to be low. Geert and Tailly<sup>4</sup> reported that, most complications can be prevented to some extent and if, despite careful prevention, complications do occur, it is most often possible to solve the problem with minimally invasive techniques. Modern stone management requires a judicious combination of ESWL and endourology<sup>4</sup>. A study from Nairobi<sup>36</sup> demonstrated that ESWL and ureteroscopic methods are highly effective in the treatment of renal and ureteric calculi as day care procedures. This is also supported by other studies<sup>1, 34-35</sup>.

## Conclusion

Urolithiasis seems common in our setting, need for prevalence studies. Male to female ratio is narrowing; need to study the factors driving it. Minimally invasive approach to urolithiasis is a safe and feasible option for the treatment of urolithiasis even in our setting. Therefore, it is possible to introduce and popularize minimally invasive techniques for the management of urolithiasis even in resource-constrained countries especially ESWL due to its non-invasiveness, less technical demand, non demand of anaesthesia meaning can be rolled down to the district hospitals. Contact lithotripsy and picking can be reserved for larger hospitals where safer anaesthesia can be offered.

## Acknowledgment

The Authors would like to convey their gratitude to all Apollo staffs to mention few, sister Salma, Betty, Mr. George and Kitwana for their valuable support they offered us during all the stages in the preparation of this work.

Authors would also like to thank Apollo administration specifically DrNazir Arab and Dr. Aslam for allowing us to conduct our study in their hospital, also for their constant encouragement and guidance throughout our study period.

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