

Trends of upper urinary tract stone management in a high volume stone center in Saudi Arabia, 12 years analysis

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Abstract

Introduction: Urolithiasis is a common urological problem globally with tremendous health and economic burden. In Saudi Arabia, an estimation has shown that the risk of developing a stone episode is 50% higher than that in Western countries. About 20% of males would experience at least one episode by 70 years of age. The introduction of minimally invasive and noninvasive methods such as shockwave lithotripsy (SWL), ureteroscopy (URS), and percutaneous nephrolithotripsy (PCNL) has driven the urologists to more complex decision-making with a noted variance in management options.

Objectives and Methods: The objective of the study was to observe the trend of upper urinary tract stone management in our institution in the past 12 years.

Methods: Charts of patients who underwent upper urinary tract lithotripsy procedures of any kind were reviewed. The information obtained included, patient's age, surgeon, surgery type, stone size, stone location, and duration of surgery.

Analysis: The data obtained were from 2006 to 2016. Excel sheets used for the collection of data and SPSS software was used for analysis.

Results: The results showed that the majority of the patients were males accounting for 65%. ESWL was the predominant approach from 2006 to 2010. In 2006, ESWL accounted for 77.7% of the cases, 76% in 2007, 70% in 2008, 64% in 2009, and 62% in 2010. However, in 2011, the rates dropped to almost 18% and URS rates have increased from a few cases per year to 64%. The frequency of URS continued to rise through the years until 2015 where URS rates reached 75%. During the 12-year period, URS is the most common upper tract procedure conducted when compared to ESWL and PCNL, accounting for 63%, 16%, and 20%, respectively.

Conclusion: In our institution, the frequency of URS rose over the years being the most abundant procedure done. ESWL rates have decreased over the years.

Keywords: Extracorporeal shockwave lithotripsy, percutaneous nephrolithotripsy, ureteroscopic lithotripsy

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INTRODUCTION

The burden of urological stone disease affects the health-care systems worldwide and carries clinical

significance. The treatment of urolithiasis in the United States is about 5.3 billion USD in total.^[1] In the Kingdom of Saudi Arabia, the risk for a stone episode is 50%

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higher than that in Western countries. About 20% of males would develop at least a single stone episode by the age of 70 years.^[2] Many alterations in the management of urolithiasis have emerged over the past 30 years, the development of technologies that promote further minimally invasive and noninvasive methods such as shockwave lithotripsy (SWL) ureteroscopy (URS) and percutaneous nephrolithotripsy (PCNL) was achieved. This spectrum of various modalities has steered urologists to complex decision-making and different approaches in management options. All these modalities have different cost effectiveness in different stone cases, for example, PCNL is a more economical option in treating staghorn stones and SWL is superior in smaller stones generally <1 cm URS is a cost-efficient option in stones in between the ones mentioned even when factoring in disposable scopes.^[3] In our current study, we aim to identify the various approaches of surgical management or urological stone disease.

METHODS

A chart review of patients who were taken for upper urinary tract lithotripsy procedures of all kinds was done. The information gathered included patient’s age, procedure type surgeon stone location, and size and duration of surgery. The most common procedures traced were ureteroscopic lithotripsy procedures, extracorporeal SWL, and PCNL. We collected the data from 2006 to 2016. Excel sheets used for the collection of data and SPSS software (IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp) was used for statistical analysis. Our aim was to observe the trend of upper urinary tract stone management in our institution in the past 12 years. All patients who had upper urinary tract lithotripsy procedures of any kind were reviewed. Quantitative analysis was done as well.

RESULTS

A total of 1214 patients are included in our study, of which 789 (65%) were male. ESWL was more dominant during the period 2006–2010. In 2006, 77.7% of the cases were treated by SWL, 76% in 2007, 70% in 2008, 64% in 2009, and 62% in 2010. Meanwhile in 2011, the rates declined to almost 18%, and URS rates have grown from few cases per year to 64%. The high rates of URS use continued to rise until 2015 where URS rates reached 75%. During the 12-year period, URS is the most commonly used procedure in comparison to ESWL and PCNL accounting for 63%, 16%, and 20%, respectively. Figure 1 reflects the trends of procedures throughout the years. Table 1 reflects the frequency of each procedure per year.

Analysis of variance was studied, ESWL significantly correlated to a time where $P = 0.01$, $R = 75\%$ $R^2 = 56\%$. However, there was no significance in both URS and PCNL with $P = 0.65$ and 0.1 , respectively.

There is no correlation between stone size and physician experience with procedure selection.

DISCUSSION

Urinary stone disease is increasing globally with growing concern toward prevention, treatment, and cost effectiveness. This has led to a number of studies initiated worldwide to better outline the demographics and various management trends. The prevalence and incidence of stone varies worldwide. This has been changing radically in the past decades; the prevalence of urolithiasis ranges from 7% to 13% in North America, 5% to 9% in the European continent, and about 1% to 5% in Asia.^[4-6] To our knowledge, not many recent studies exist outlining this prevalence and trend in Saudi Arabia.

Many risk factors are attributed to the increased incidence of stone formation; these factors include age, gender, ethnic background, general lifestyle, and dietary habits,

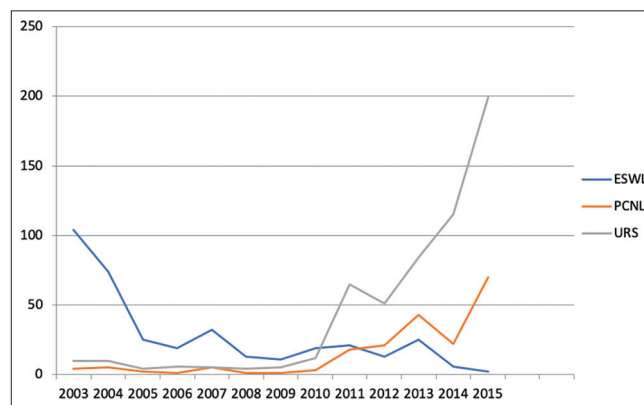


Figure 1: The trend in stone management over the years

Table 1: Number of ESWL, PCNL and URS cases per year from 2003 to 2015

Year	ESWL cases	PCNL cases	URS cases
2003	104	4	10
2004	74	5	10
2005	25	2	4
2006	19	1	6
2007	32	5	5
2008	13	1	4
2009	11	1	5
2010	19	3	12
2011	21	18	65
2012	13	21	51
2013	25	43	84
2014	6	22	115
2015	2	70	199

containing high protein, fat, sodium, and calcium all are contributors to stone creation, leading more patients presenting with urolithiasis in all over the world including Saudi Arabia.^[2]

In our findings, 1214 patients were included and 65% of which were male. The use of SWL for stone management was 65% in the early 2000s and has dropped to 16% of cases by 2015. URS and PCNL use replaced SWL and reached 63% and 20% of cases at the end of 2015. Kerb *et al.* revealed that URS use has increased by 53% from 1990 to 1998; on the other hand, the use of SWL has declined by 15%.^[7] Similar findings were revealed by Oberlin *et al.*, who showed an increase in the use of URS. The reason behind this is due to better equipment with superior efficiency and more cost effective.^[8] Most of the studies have shown a rise in the use of URS over the years with a decrease in the use of PCNL and ESWL. With appropriate use of analgesia and suitable antibiotic prophylaxis, URS is performed on patients as an outpatient day surgery seldom requiring admission postoperative. The admission causes are mostly related to patient factors, i.e., social reasons. Postoperative complications such as perforations, stent-related pain or pyelonephritis can also lead to admission in about 2% of patients.^[9,10]

Turney *et al.* have analyzed the shifts in the management of upper urinary tract stones in the United Kingdom. They have noticed an increase in flexible URS 103% increase over 5 years. ESWL, however, is still performed more commonly in the United Kingdom and is the conduction of this procedure is stable.^[6]

In a study recently published by Yildirim *et al.*, a questionnaire was filled by urologists with variable expertise in Turkey and has shown a general preference for URS. The first-line treatment options per size of stone and location were addressed. ESWL was preferred in about 49% calyceal stone sized <1 cm, 61.2% for 1–2 cm upper-middle pole stones, and 57% force stones <1 cm located in the proximal ureter. Rigid URS was by far the most widely preferred procedure for lower ureteric stones 93%–94%.^[11]

Tiselius and Chaussy compared the use of the above-mentioned procedures between 1985 and 2013 and have reported a huge rise in endourology-based managements of stone disease; however, ESWL use rate remained stable. Furthermore, they have concluded SWL has been considered by urologists as a second- or third-line procedure for stone removal due to the fact it is considered by them as a boring procedure and does not fulfill their ambitions as surgeons.^[12]

Heers and Turney have studied the hospital statistics for stone episodes and their treatment options. Their study showed that ureteroscopic treatment methods are on a steady rise with a 36% increase since 2009/2010. Semi-rigid and flexible URS showed a dramatic growth reaching a 103% increase since 2009.^[13]

A systematic review included eight articles from the Australian continent, the United Kingdom, Canada, Brazil, and the United States. The rate of URS had a 251.8% increase in the total number of treatments. While total treatments of stones using PCNL remained stable, however, SWL and open surgery rates have fell by 14.5% and 12%, respectively. This study also showed that URS was performed in 1234 patients in Brazil in 1998 and by 2012, 8725 patients had URS performed in an attempt to treat urolithiasis, whereas SWL rates continued to increase but with a much lower pace when compared to URS.^[14] In our study, data was collected from a single institute; because in Saudi Arabia no nationwide registry for urolithiasis exists. All data in Saudi Arabia are from the efforts of independent centers like ours.

The ambulatory treatment of urolithiasis in California was assessed by Raheem *et al.* It was found that in between 2005 and 2010, the URS usage has dramatically increased from 39% in 2005 to 49% of cases in 2010 ($P < 0.0012$) while the utilization of SWL declined to 51% of cases in 2010 from 61% of the patients in 2010.^[15]

CONCLUSION

The frequency of URS usage has changed over the years. In our hospital, URS has become the most widely used procedure over the past few years. SWL rates have decreased over the years. This is in accordance with global epidemiological studies addressing this issue. URS has proven itself as a feasible option in certain cases of urinary stone disease; this makes it at the frontier of future advances in urolithiasis management.

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Conflicts of interest

There are no conflicts of interest.

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