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TO COMPARE THE EFFICACY OF URETEROSCOPIC LITHOTRIPSY VERSUS EXTRACORPOREAL SHOCKWAVE LITHOTRIPSY IN THE TREATMENT OF PROXIMAL URETERIC STONES OF SIZE BETWEEN 10MM TO 15MM.

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ABSTRACT

BACKGROUND: The overall probability that an individual will form stones varies in different regions of the world. The risk of having urinary tract stones in the developed country populations is between 10-15%. The prevalence of urinary tract stone disease is 13% for adult males and 7% among the females. Most of the patients with ureteric stones present with colicky pain, however some may be asymptomatic and are identified on routine assessment. Large stones typically require active treatment. Stones that do not pass can be removed by different treatment modalities such as Extracorporeal shock wave lithotripsy (ESWL), Ureteroscopic lithotripsy (URSL) and open or laparoscopic ureterolithotomy.

OBJECTIVE: To compare the efficacy of Ureteroscopic lithotripsy versus extracorporeal shockwave lithotripsy in the treatment of proximal ureteric stones of size between 10mm to 15mm.

MATERIALS AND METHODS: This was a randomized control trial of 138 human subjects, conducted at Department of Urology, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar. Total sample size was based on the previously reported stone clearance rates for proximal ureteric stones (88% URSL[12] and 67.5% for ESWL[11]), 95% confidence interval and power of 90%.

RESULTS: In this study mean age was 47.36 years SD ±15.4. Fifty nine percent patients were male and 41% patients were female. Eighteen percent patients had stone size 10mm, 19.6% patients had stone size 11mm, 19.6% patients had stone size 12mm, 16.7% patients had stone size 13mm, 13.6 patients had stone size 14mm, 11.6% patients had stone size 15mm. ESWL was effective in 65.2% and was not successful in 34.8%, while in the URSL group 84.1% were treated successfully and in 15.9% patients with proximal ureteric stones the stone clearance efficacy was not effective.

CONCLUSION: Both URSL & ESWL are well accepted minimally invasive modalities of treatment for proximal ureteric stones. We conclude that URSL has yielded superior results as compared to the ESWL group in treatment of patients with proximal ureteric stones of size 1-1.5cm.

KEY WORDS: Ureteroscopic lithotripsy, extracorporeal shockwave lithotripsy, proximal ureteric stones.

INTRODUCTION

Pakistan is situated in the Afro-Asian stone belt. So, we come across majority of patients having ureteric stones. The overall probability that an individual will form stones varies in different regions of the world[1]. The risk of having urinary tract stones in the developed country populations is between 10-15%. The prevalence of urinary tract stone disease is 13% for adult males and 7% among the females[2]

Most of the patients with ureteric stones present with colicky pain. Sometimes these stones remain asymptomatic and are identified on routine assessment[3]. Most small ureteric stones pass spontaneously. Large stones typically require active treatment. Stones that do not pass can be removed by different treatment modalities such as Extracorporeal shock wave lithotripsy (ESWL), Ureteroscopic lithotripsy (URSL) and open or laparoscopic ureterolithotomy[4, 5].

ESWL is a technique for shattering stones with a shock wave produced outside the body[5]. Stone clearance after ESWL is variable and influenced by stone size, location, and composition amongst other factors[5, 6, 7, 8]

Latest advances in intracorporeal lithotripsy have also facilitated fragmentation of ureteric stones. Pneumatic lithotripsy is one of these types. It is cheaper form of intracorporeal lithtripsy[7]. URSL is one of the most effective endoscopic treatment of stones in ureter[9].

Improved technology in extracorporeal and intracorporeal lithotripsy and advent of more advance ureteroscopes has dramatically reduced the role of open stone surgery. More recently, this rate decreased to 8% in Pakistan and 0.7–2% in centers of industrialized world[10,11,12].

ESWL was shown to be efficacious for upper ureteral calculi less than 10 mm in diameter in several series[13].While the optimal treatment for stones, larger than 1 cm remains to be determined with ESWL and URSL being acceptable options.

Variable stone clearance rates have been reported in published literature. In a study, the stone clearance rate was 92% in URSL group and 58% in ESWL group in patients presented with more than 10mm proximal ureteric stone[14]. Another study demonstrated 88% and 60% stone-free rate for URSL and ESWL, respectively[15]. However, insignificant difference in stone-free rate (URSL = 73.3% vs ESWL = 67.5%) has also been reported[16].

Despite the definite success of endourological stone treatment, ongoing questions about optimum management remain controversial among urologists. Established guidelines are available which recommend ESWL as the first treatment for proximal ureteric calculi less than 10mm. However, treatment recommendations for larger proximal ureteric stones (more than 10mm) are not yet established[17]. Therefore, the purpose of this study is to find out the comparative efficacy of ESWL and URSL in the treatment of such larger stones. The results of this study will be projected to the management and senior health professionals in the same field to develop a scientific plan for the treatment of patients with proximal ureteric stones.

Urolithiasis has afflicted humans throughout the known history of mankind. In 1901 the English archeologist E. Smith found a bladder tone from a 5000 years old mummy at EI Amrah, Egypt[18]. Treatments for stones were mentioned in ancient Egyptian medical writings from 1500 BC[19,20]. The overall probability of urinary stones formation in an individual varies in different parts of the world. The prevalence of Urolithiasis in the developed world is about 4-20%[21]and in the developing world like ours, it is the most common disease in our daily urological practice[22,23]. Pakistan is also situated in the hub of stone belt[24]. No part of the human urinary tract is immune to stone formation. So Stones can be found in kidneys, ureters, bladder and even the urethra. Stones found in the upper part of ureter are called proximal ureteric stone. Technically we define proximal ureteric stone is defined "as the stone in ureteral segment between the ureteropelvic junction and the upper border of the sacroiliac joint.

MATERIALS AND METHODS

This study was conducted at Department of Urology, Institute of Kidney Diseases, Hayatabad Medical Complex, Peshawar. Duration of the study was one year (from January 2014 to December2014). Study design was randomized controlled trial in which a total of 138 patients were observed by taking 69 patients in each group based on the previously reported stone clearance rates for proximal ureteric stones (88% URSL[15] and 67.5% for ESWL[16]), 95% confidence interval and power of 90%. More over consecutive non-probability sampling technique was used for sample collection. All patients with upper ureteric stones of 10 mm to 15 mm size, adult patient with age

more than 18 years, patients of either gender were included while patients with history of open surgery on ureter, active urinary tract infection (assessed through TLC>11x10^9/L, positive urine culture), already on treatment for kidney stones or urinary tract abnormality (assessed through previous medical record) were excluded from the study.

STATISTICAL ANALYSIS:

Analysis was done with SPSS version 16. Quantitative variables such as age and stone size were presented as mean ± SD and categorical variables such as gender and efficacy were presented as frequencies and percentages. Chi square test was applied for the comparison of efficacy in two groups. P-value was obtained and the results were considered statistically significant when p-value was 0.05 or less. Results were presented in the form of tables.

RESULTS

The study included a total number of 138 patients with proximal ureteric stones. Which were divided in two groups of 69 patients each. Mean age was 47.36 years ±15.4 SD. Eighty one (59%) patients were male and 57(41%) patients were female. Twenty six (18.8%) patients had stone size 10mm, 27 (19.6%) patients had stone size 11mm, 27 (19.6%) patients had stone size 12mm, 23 (16.7%) patients had stone size 13mm, 19 (13.6%) patients had stone size 14mm, 16 (11.6%) patients had stone size 15mm (Table 1). ESWL was effective in 65.2% (n=45) while in the URSL group 84.1% (n=58) were treated successfully. This shows that the efficacy in terms of stone clearance was highly significant in both groups (p=0.018) (table2). The difference between the mean stone size of the two groups was insignificant (0.918) (Table 3).

Table No: 01

STONE SIZE(mm)	Frequency	Percentage
10	26	18.8
11	27	19.6
12	27	19.6
13	23	16.7
14	19	13.8
15	16	11.6
Total	138	100.0

Table No: 02

			Group		Total	
			ESWL	URSL		p-value
Stone clearance	No	Count	24	11	35	
		% within Group	34.8%	15.9%	25.4%	
	Yes	Count	45	58	103	0.018
		% within Group	65.2%	84.1%	74.6%	
Total		Count	69	69	138	
		% within Group	100.0 %	100.0 %	100.0%	

Table No: 03

	Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
Stone size	ESWL	69	12.2319	1.61923	.19493	0.918
	URSL	69	12.2029	1.66786	.20079	

DISCUSSION

The management of stone disease has travelled for centuries from herbal medication to the tremendous development in modern day endourological and extracorporeal shock wave lithotripsy modalities of treatment. Various research studies have addressed the effectiveness of different sources of energy to disintegrate stones in the ureter.

There are several intracorporeal lithotripsy (URSL) alternatives, such as electro hydraulic lithotripsy, ultrasonic lithotripsy, pneumatic, and holmium laser lithotripsy. Among these treatment options we use pneumatic lithotripsy, successfully for ureteric stones treatment. According to the literature, in some studies the success rate of pneumatic lithotripsy appears to

be more than 90%[14,25]. ESWL can be a modality treatment for most upper urinary tract stones, because of its simplicity, noninvasiveness and minimal morbidity. However, some stones are difficult to fragment by ESWL or the fragments may remain in the urinary tract even after successful fragmentation of the stone.

In a study conducted by Dellabella M et al[26] for stones between 1-2 cm size, the URSL (pneumatic lithotripsy) group showed an efficacy of stone clearance for upper ureteric stone to be 82.1%. This is comparable to our stone clearance results in terms of efficacy which is 84.1%.However the mean stone size in the study (10mm+5.6SD) is smaller than our study results which is (12.20mm+1.66SD).

Our study results shows comparable results in terms of mean stone size, mean age and efficacy of stone clearance to a national study showing efficacy of 86.7% in terms of stone clearance URSL in the proximal part of ureter[27].

In another study by Slam J and coleagues[28] the efficacy of ESWL group for proximal ureteric stone of size larger than 12mm was compared. The results of their study showed contrasting results i.e. 50% success rate as compared to that of ours which is 65.2%. Similarly to their disfavor the study sample size of their study is also smaller (n=35) as compared to our sample size(n=69).

The strength of my study is that it is the first randomized control trial study in the present set up, on this very important and common topic. This study has generated some local statistics about the management of proximal ureteric stones in our adult study population and the results of this study can now be used as a first hand evidence to make modifications in our local guidelines for the treatment and follow up of patients with proximal ureteric stones .Moreover it is a larger sample size study compared to the other nationally and some of the internationally published studies on this topic.

Our study has certain limitations .We couldn't asses the hardness of stone on CT scan measuring the Hounsfield (HU) units of stone density, before embarking upon the desired modality of treatment because it may be a confounding factor in especially in ESWL group. Moreover our patients' follow-up in both groups was for a very short period of time.

This study is implicated on urologists, surgical specialists, nephrologists, & general medical practitioners who come across the patients suffering from proximal ureteric stones. There are some unanswered questions regarding the efficacy of stone clearance that why out of 138 patients, some patients were able to successfully clear the stones while others couldn't make it in spite of similar stone size in both of the treated groups. So, further research is desired to have an answer to these unanswered queries.

CONCLUSION

Both URSL & ESWL are well accepted minimally invasive modalities of treatment for proximal ureteric stones. We conclude that URSL has yielded superior results as compared to the ESWL group in treatment of patients with proximal ureteric stones of size 1-1.5cm. Further research is desired in the form of RCT to evaluate the efficacy of pneumatic lithotripsy with laser and ultrasonic lithotripsy in our set up.

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