

Extra corporal shock wave lithotripsy in Sulaimani Teaching Hospital

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Abstract

A total of 70 patients with urinary stone disease had ESWL therapy in sulaimania teaching hospital. Designe; this is a prospective study on a recent available treatment Clinical assessment were made by post ESWL therapy when the patients pass the gravels and followed by a series of radiological examinations for the success of the therapy. Results; the study showed a success rate of 77%, patients required up to 3 months to achieve stone free. Conclusion; ESWL provide a non invasive, simple therapy for the management of urinary stone disease, provided the stone is less than 2cm.

Keywords: Extracorporal-shock wave, Renal stone, Ureteric stone.

Introduction

Urinary calculi are the third most common affection of the urinary tract, they are common in both animals and human⁽¹⁾, It has a high incidence of recurrence rate of about 50-70% which produce a heavy complaint on the sufferers and the health care system. A major revolution in stone management occurred with the development of ESWL, it has become the treatment of choice for most renal stones and success rate of more than 90% have been reported. Stone larger than 2 cm in diameter and hard stones are more difficult to fragment.

The results for ureteric stones are generally less satisfactory 80-90% because they are more difficult to visualize and ureteric stone lack an adequate fluid interface which is necessary for successful ESWL treatment.⁽²⁾ Unselected upper urinary tract calculi can be fragmented approximately in 70% of cases.⁽³⁾ The changes which have occurred in the design of lithotripters have been made to make ESWL as minimally invasive as

possible and to be used without general or epidural anesthesia.⁽⁴⁾

Success of treatment in patients under going ESWL was defined as being free of calculus at 3 months and having an asymptomatic fragments of less than 4mm.⁽⁵⁾ factors which lead to persistence of residual fragments following ESWL decreases the likelihood of a stone free status these factors include stone size (stone bigger than 2cm have a longer duration of persistence of fragments and have less chance of stone-free status), lower pole caliceal stone, stone in caliceal diverticulum, and stone in hydronephrotic kidney. Stone composition is also a factor in achieving a stone-free rate, stone which are hard to fragment and have larger fragment which do not easily pass have lower stone-free rate with ESWL, stone-free rate of 90% are achieved for renal stone less than 1 cm or less in size, this will reduce to 30-50% in staghorn calculi. Another factor affecting the stone fragmentation and stone-free rate

is the size of energy focus and the peak pressure at the focus, a small energy focus will demand very accurate targeting and may be associated with a higher retreatment.⁽⁴⁾ The high success rate and low morbidity of this treatment are attractive to patients and urologists, it is generally accepted that ESWL is the better primary therapy for small upper urinary tract calculi less than 2 cm.⁽⁵⁾

Patients and methods

Seventy patients with urinary stone disease aged 14-73 year, 43 male and 27 female underwent ESWL from January 1999-October 1999 in Sulaimania teaching hospital, using lithostar siemens – lithotripsy.

Patients were evaluated by history, physical exam, vital sign and investigations including urinalysis, culture of urine, ultrasound, plain X-Ray of the abdomen and excretory urography to identify the states of the kidney and the stone number with its size taking the greatest dimension of the stone, blood urea, serum creatinine and coagulopathy in most of the patients. The general conditions of the patients were improved before ESWL; bowel preparation was advised to insure adequate stone visualization.

On the day of ESWL which was performed as an out patients procedure, the patient lies on the table and screened by fluoroscopy to identify the calculi, the location of the calculus was categorized as pelvic, caliceal, pelvis plus caliceal, ureteral, this classification of the location was based on the location of the calculus at the ESWL, no push back, no double J-stent was used but dialysis was informed for those with solitary kidney. Then the positioning of the patient in relation to the stone was achieved to be located at the center of the focal peak pressure using both patient and the shock wave source movement to bring the stone and the focus in to alignment which is called coupling, where the flank of the patient will be over the water cushion with a convex pressure head in which the patient and water both are separated by a membrane. The procedure was monitored by

X – Ray from two angles –10, +30 degree, ESWL started by using the principle of propagation of the shock wave beam through soft tissue and then to focus this shock to the calculus, which is generation of electromagnetic field using passage of electric current through a coiled wire. After coupling the generation of shock wave started from low voltage energy and rising to high energy with total rate of 3000-4000 shock which lasts for one hour. Analgesia used during the procedure for only 5 cases (Diclofenac – Na. 75 mg. i.m.).

After lithotripsy, the patients were advised to take plenty of water; to urinate in container for collection of gravel’s, the patients were kept on diclofenac Na and antibiotic for 7 days. The patients were informed about the occurrence of haematuria, pain, and to come back on need. Post an X-Ray, ultrasonic examination, followed ESWL the patient and examination of the gravel’s, second session of ESWL was arranged after 2weeks if needed.

Contraindication to the procedure was pregnancy, children, anatomical abnormalities of the kidney, relative contraindication was stone bigger than 3 cm., multiple stones & weight more than 80 kg.

Results

Table (1): Patient characteristics, stone position, size.

Site	Number	Size	Recurrence
Pelvic	40	1-3.5cm	8
Caliceal	Upper 7	1-1.4cm	
	Middle 3	1-1.2cm	
	Lower 6 (1 > one stone)	0.8-2cm	
Ureteral	14		3
	Upper 6	1-1.6cm	
	Middle 1	1cm	
	Lower 7 (1 > one stone)	1-1.6cm	
Total	70	0.8-3.5	11

Discussion

With the introduction of second and third generation lithotripters, out – patient anesthesia – free stone treatment has become available, which is attractive to most patients, but they also want the treatment to be successful and free of complications.

From table-1, the selection of the data shows 70 patients with unselected stone size ranging from 0.8-3.5 cm in length had ESWL therapy, from which 11 cases were recurrence, in the table-2, the result of fragmentation is 54 cases out of 70 patient with the highest percentage occurred in the renal pelvis in relation to the ureter; 82.5% and 69.4% respectively. The failure of fragmentation was occurred in 16 cases out of 70 patients, still the high incidence occurs in the ureter in relation to the kidney. All these contribute to the difficult localization of the ureteric stone and the lack of adequate fluid around the ureteric stone, which is needed to achieve adequate fragmentation. Nevertheless, in many studies of ESWL for lower and mid-ureteric stones, stents were also placed to achieve better fragmentation⁽⁶⁾ which improve the success rate for treatment of ureteric stone, also it may be used to push the stone in to the renal pelvis where the ESWL is more successful⁽²⁾.

In table-4, fragmentation is more with group which has stone size between 0.8-1.2cm and lowest for those with bigger size, 87.9% and 33.3% respectively and this is a known fact for the urologist when the size of the stone is larger the possibility of the fragmentation and re-treatment rate is higher.

Table-5 shows the non-fragmentation rate that is 16 out of 70 patients; it is also of more incidences in bigger size of stone 66.7% and 12.1% respectively. So there is more chance of non-fragmentation in larger.

Table-3 and 6 shows that the rate of non fragmentation which is higher in lower ureteric stone and higher in big stone of the pelvis of the kidney.

Stevan *etal.* recommend the management of calculi in single kidney and treatment of staghorn calculi by ESWL with use of doubled- J stent and he found no statistically significant difference in serum creatinine or

creatinine clearance before and after ESWL.⁽⁷⁾

The size of a stone is obviously of great importance for the fragility shown in vitro and vivo. This could be probably be explained by the insufficient amount of shock wave energy delivered to the nucleus of a large stone. Despite good fragmentation of the stone periphery, fragments might shield the central portion against the shock wave energy. Thus, a larger stone than 20mm, with a high CT attenuation can be expected to be difficult to break.⁽⁸⁾

Table-7 shows retained gravel's after the ESWL treatment, which is 21 out of 70 with higher incidence in the ureter.

Table-8 shows clearance rate after treatment, which is about 70%.

These retained fragments after ESWL remain a problem as such patient are at risk for development of complication like obstruction which occurred in 3 cases. Clearance rate was 70%, but it takes about 4 months, during which there were many outpatient visits, with their associated disability costs.

Only one patients need hospitalization due to pain. Martin *etal.* found that pain and obstruction is more frequent for stone bigger than 2.5 cm following this form of therapy.⁽⁹⁾

Erturk *etal.* reported an 81% stone-free rate at 3month for ESWL, using the Dornier HM3 and E1 Gammal *etal.* reported a 92% stone-free rate when distal ureteric stone were treated with the siemens lithostar. Costs is another factor in deciding ESWL treatment in A.F. BIERKNS *etal.* study, ESWL was less expensive than ureroscopic ureteric stone management, the cost arose mainly from hospital stay and anesthesia fees, while ESWL was performed on an out-patient basis.⁽⁶⁾

Conclusion

ESWL still provides a noninvasive, technically simple and safe option for the management of renal, ureteric stone, given that the best results are obtained for stone less than 2cm. However, there is also a minimum size, the smaller the stone, the more difficult the location by radiological techniques especially if it is in the ureter. Fortunately, such small stones usually pass spontaneously. ESWL for large calculi will result in rise of morbidity, complications, retained fragments.

It has been reported that, stone-free success appear to be highly related to stone size,

stone less or equal to 1cm are ideal and often 90% stone-free rate is reported, for stone up to 1.2cm stone-free rated is noted to be 87% with ESWL alone.⁽³⁾

There has been much experimental study on the geometry and physics of ESWL, as well as on the possible damage it may do to the kidney.⁽¹⁰⁾

We believe that our study results are comparable to other reports, provide a strong clinical evidence that this approach to the management of stone disease need adequate patient selection in relation to the size, with other relative feature like age of patient and patients contraindication to ESWL, renal anatomical condition, other wise the procedure is easy, safe, economic, with specific range of indications for each.

References

1. Tanagho. E.A; Smith General Urology, 14th ed. A Lange medical book, philadlphia, 1995 , 305 -33.
2. Christopher Dawson, Hugh N. Whitfield; The management of urinary stone disease, Urology, *the Medical Group (Journals) Ltd.* 1994,1, 73-88.
3. Donald L. Lamm, Angelo S. Paolo, Frederick A. Poala etal, Campbells' Urology Review and Assessment, 1st ed. W.B. SAUNDERS Company, philadlphia, 1995, 264 - 268.
4. H.N. Whitfield; Stone disease - progress with lithotripsy, *Recent Advances in Urology/ Andrology 2.* Churchill Livingstone, Edinburgh, 1998, . 2, 13 - 30.
5. John J. Smith, Jean G. Hollowell, Robert A. Roth, Multimodality treatment of complex renal calculi, *The Journal of Urology*, 1990, . 143, 891-894.
6. A.F. Bierkens, A.J.M. HENDRIKX, J. J. M.C.H.DELA ROSETTE etal. The treatment of mid - and lower ureteric calculi: extracorporal shock - wave lithotripsy Vs laser ureteroscopy. A comparison of costs, morbidity and effectiveness, *British Journal of Urology*, 1998, 81, 31-35.
7. Stevan B. Stroom, Michael A. Geisinger, Combination therapy for staghorn calculi in solitary kidneys; functional results with long term follow up. *The Journal of Urology*, 1993, 149, 449-452.
8. Y.H. WANG, L. Grenabo, H. Henelin, Analysis of stone fragility in vitro and in vivo with piezoelecnic shock wave using the EDAP LT-O1, *The Journal of Urology*, 1993, 149, 669-702.
9. Martin 1. Resnick, Andrew C. Novick, Urology Secrets; Renal calculi, Hanley and Belfus, INC./ Philadelphia 1995, 249.
10. John Blandy, Christopher Fowler, Urology, second edition, The Blackwell Science Ltd. UK. 1996, 224-226.

