

EXTRACORPOREAL SHOCK WAVE LITHOTRIPSY IN 5500 PATIENTS WITH URINARY TRACT CALCULI

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SUMMARY : *In this report experience with 5500 urinary tract calculi patients treated with extracorporeal shock wave lithotripsy (ESWL) is presented. Stone localization was usually fluoroscopic while nonopaque stones were localized ultrasonographically using the overtable module. Maximum shock wave energy and number delivered per session were 19 kV and 4000 shock waves for adults whereas 17.8 kv and 3000 shock waves for children. Children were treated under dissociative anesthesia using ketamine. Stone localizations were 3990 (72.55 %) renal, 1448 (26.33 %) ureteral and 62 (1.12 %) intravesical. Number of patients stented before the procedure was 605 (11 %). Overall stone free rate was 48.47 % (2666 patients) and fragmentation rate as 87.27 % (4800 patients). ESWL treatment was unsuccessful in 700 (12.72 %) cases. The only major complication encountered was rupture of renal pelvis in 2 cases which required surgical intervention.*

Key Words : *Extracorporeal Shock Wave Lithotripsy, Urinary Tract Calculi.*

INTRODUCTION

Extracorporeal shock wave lithotripsy (ESWL) is certainly an effective noninvasive treatment of urinary tract calculi. Second generation lithotripters offer significant advances in technology and delivery of high energy shock waves when compared to the original Dornier HM-3 lithotripter (13). In our institution we use Siemens Lithostar plus lithotripter which uses electromagnetic waves as energy source. This report presents our experience with 5500 patients with urinary tract calculi treated with ESWL using Siemens Lithostar Plus.

MATERIALS AND METHODS

5500 patients 5265 (95.73 %) adults 235 (4.27 %) children having urinary tract calculi were treated with ESWL by Siemens Lithostar Plus lithotrip-

ter in Gazi University, Faculty of Medicine, Department of Urology between 1989-1994 on an outpatient basis. Ages were between 2-84. Children were treated under dissociative anesthesia using ketamine whereas adult patients did not receive anesthesia. Maximum shock wave energy and number delivered per session were 19 kV and 4000 shock waves for adults meanwhile 17.8 kV and 3000 shock waves per session for children respectively. In general fluoroscopic localization was used meanwhile nonopaque stones were localized ultrasonographically using the overtable module. Stone localizations were 3990 (72.55 %) renal, 1448 (26.33 %) ureteral and 62 (1.12 %) intravesical (Table 1). All the patients were treated on an outpatient basis. Urinalysis, urine culture, renal function tests, physical examination, plain abdominal X ray

Stone Localization	Number Of Patients	%
Renal	3990	72.55
Upper Ureter	420	7.64
Mid. Ureter	362	6.58
Lower Ureter	666	12.11
Intravesical	62	1.12
TOTAL	5500	100

Table 1 : Stone localization.

and excretory urograms were performed routinely pre ESWL and post ESWL and additional imaging modalities (eg: USG, CT scan) were performed when indicated.

RESULTS

When we examined renal calculi 47.71 % of patients were stone free meanwhile 77.41 % stone fragmentation was observed (Table 2). ESWL was most successful for upper ureteral stones with 60.99 % stone free rate followed by middle ureter stones with 51.38 % stone free rate while least success achieved for lower ureteral stones with 42.19 % stone free rate (Table 2). Fragmentation rates for upper, middle and lower ureteral stones were 82.14 %, 79.28 %, 59.60 % respectively. Stone free rate and

fragmentation rate for intravesical stones were calculated as 58.06 % and 77.41 % respectively (Table 2). Overall stone free and fragmentation rates were 48.47 % and 87.27 % patients (Table 2). Recurrence was observed in 71 (1.29 %) patients. ESWL was unsuccessful in 700 patients (12.72 %) and among these 71 patients (10.4 %) were treated with Ureterorenoscopy, 25 (3.57 %) with ureteral catheterization, 5 (0.71 %) with percutaneous lithotripsy, 20 (2.85 %) with sistolithotripsy, 91 (13 %) with Ureterolithotomy, 86 (12.28 %) with pyelolithotomy and 2 (0.28 %) with repair of renal pelvis. Remaining 400 patients failed to come to control.

Complications encountered were dermal ecchymoses 5500 (100 %), hematuria 5050 (91 %), colicky pain 814 (15.70 %), stone street 311 (5.65 %) fever 198 (3.60 %), acute pyelonephritis 155 (2.81 %), rupture of renal pelvis with urinoma formation 2 (0.036 %), perirenal hematoma with scrotal hematoma formation 2 (0.036 %) (Table 3).

DISCUSSION

Since the introduction of original Dornier HM-3 lithotripter ESWL, a revolutionary change in treatment of urinary tract calculi, has replaced open surgical intervention for most urinary tract stones. The Dornier HM-3 lithotripter uses an underwater

Stone Localization	Number of Patients	Stone - Free Rate		Fragmentation Rate	
		Number of Patients	%	Number of Patients	%
Renal	3990	1904	47.7	3723	93.30
Upper Ureter	420	259	60.99	345	82.14
Mid. Ureter	362	186	51.38	287	79.28
Lower Ureter	666	281	42.19	397	59.60
Intravesical	62	36	58.06	48	77.41
TOTAL	5500	2666	48.47	4800	87.27

Table 2 : Stone free and fragmentation rates according to stone localizations.

Complication	Number Of Patients	%
Dermal Ecchymosis	5500	100
Hematuria	5050	91
Colicky Pain	814	15.70
Stone Street	311	5.65
Fever	198	3.60
Acute Pyelonephritis	155	2.81
Rupture of Renal Pelvis	2	0.036
Perirenal+Scrotal hematoma	2	0.036

Table 3 : Complications after ESWL.

electrical discharge to generate a spherical shock wave (3). Second generation lithotripters offer significant advances in technology and delivery of shock waves providing a lower energy density at the entry point combined with improved focusing capacity which afford easier patient handling eliminating treatment in water bath. As a result with second generation lithotripters extracorporeal shock wave lithotripsy could be done without anesthesia and complication rates become lower (2, 15). Siemens lithostar plus is one of the second generation lithotripters which is used in our clinic of-

fering above mentioned advantages. George W. Drech et al and Daniel M. Newman et al reported 77 % and 78 % overall stone free rates respectively and both stated decrease in success rates with increase in stone number and stone size (4, 6). In our clinic average stone size was calculated as 1.3 cm² but especially during the first 1000 patients stone burden and number was greater than 3 cm² and 3 stones for most patients decreasing our success rate. Besides more than half of our patients were referred to our hospital from different cities and institutions making patient follow up difficult.

For upper, middle and lower ureteral stones literature reveals success rates as 80.8-94.6 %, 84.61 % 81 % respectively (5, 7, 8, 12). As the larger series of ESWL treatment were done with Dornier HM-3 most of these patients were stented especially for upper and middle ureteral stones which could increase the efficiency of ESWL by 20 %. However with Siemens lithostar plus ureteral stone localization could be done without stenting obviating an invasive procedure with comparable success rates. These authors also found higher success rates in nonimpacted ureteral stones (5, 7, 8, 12).

We believe that another reason which decreases our success rates was considerable number of patients having staghorn calculi. Today it is accepted that for treatment of staghorn calculi additional modalities such as percutaneous lithotripsy are necessary for higher success rates (11, 14).

In the literature perirenal and subcapsular fluid (blood or urine) accumulation have been reported in as many as 24-32 % of patients (9, 10). When we consider our results significant urine extravasation occurred only in 2 (0.036 %) cases which required surgical intervention. In patients (including the 2 with scrotal hematoma formation) with perirenal and subcapsular hematoma formation bed rest with prophylactic antibiotics gave excellent results. Copcoat et al reported 2.83 % stone street formation comparable to our results (1). Patients having acute pyelonephritis were treated successfully with antibiotics and ureteral catheterization in presence of obstruction.

As a result ESWL was found to be a successful mode of treatment for urinary tract stones which could be performed on an outpatient basis without anesthesia with least number of complications.

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