



TO DETERMINE THE OUTCOME OF EXTRACORPORPOREAL SHOCK WAVES LITHOTRIPSY FOR HIGH DENSITY RENAL STONE ON NON-CONTRAST COMPUTED TOMOGRAPHY.

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ABSTRACT... Objectives: To determine the outcome of extracorpororeal shock waves lithotripsy for high density renal stone on non-contrast computed tomography. **Study Design:** Descriptive study. **Setting:** Urology Department of Chanka Medical College Hospital (CMCH) Larkana. **Period:** 1st November 2017 to 31st October 2018. **Material & Method:** Patients in the age range of 25-75 years were selected, irrespective of their gender. After 12 weeks final outcome of ESWL was measured by performing plain X-ray KUB films before and after procedure. Satisfactory outcome was defined as stone clearance in <3 sessions of the procedure. **Results:** According to our inclusion and exclusion criteria 122 patients were selected for ESWL. Among them there were 41.8 (n=51) females and 58.1% (n=71) males. The mean age of the patients was found to be 34.08+ 9.53 years. Approximately more than half of the patients 57.4% (n=70) patients were present in the age group of in ≤35 years. The mean size of the stone was 1.51 + 0.5 cm whereas mean stone density as scan was 772 + 22.2HU. Patients were having renal or ureteric stones for mean duration of 2.07 + 0.31 months. Around 69.7% of patients had renal stones and 30.3% of patients had ureteric stones. Stone clearance was found in 58.2% (n=71) of the patients. **Conclusion:** Non-contrast enhanced CT scan is the most frequently used investigation to diagnose kidney stones and decide its treatment modality. Outcome of ESWL also depends on various factors as mentioned in the study.

Key words: Extracorpororeal Shock Waves Lithotripsy, Renal Stones, Ureteric Stones.

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INTRODUCTION

Extracorporeal shock wave lithotripsy (ESWL) is the most commonly used treatment modality for urinary tract stones.¹ The diagnosis of urinary stones is made by X-ray, ultrasound and CT scans. CT scan without contrast is found to be the investigation of choice for evaluating urinary stones.² The size and location of stone found on CT scan is used to determine whether patient is suitable for ESWL or not.³ Various studies have shown the positive predictive factors for ESWL and ESWL was done on the basis of findings of CT scan without contrast.⁴ Success of ESWL depends on following factors like disc skin calculus (DSC), density of the calculus itself and body mass index (BMI) of the patient. Decreased disc skin calculus and decreased density of the calculus are positive predictive factors for ESWL.^{5,6} CT scan without contrast is used to

identify causes of radiolucent filling defects. It does so by measuring density of the radiolucent filling defects in Hounsfield units. The density of calculi is greater than the density of tumors or blood.^{7,8} Plain X-ray of abdomen and pelvis are also used to identify renal stones, but they cannot distinguish between different densities. CT scan without contrast is the most preferred investigation in patients with renal colic as it can distinguish density differences of <0.5%.⁹ It also determines the fragility of the stone by its density. The outcome of ESWL is also affected by its fragility like more fragile stones requires only one session of ESWL.^{10,11} Stones in the urinary tract are made up of uric acid, phosphates and rarely cysteine. The composition of stone can predict the fragility of the stone; hence it ultimately affects the clinical outcome of ESWL. Patients with calculi of >750 HU approximately 70% of patients require

more than three sessions of ESWL. Around 37% of patients had complete clearance after only one session of ESWL. A study showed that 77% of the calculi with a diameter of >1.1cm needed three or more than three sessions of ESWL and only 60% of the patients were cleared of stones.¹² However, different studies show different rates of clearance and variable outcomes compared to the number of ESWL sessions.¹³ There is no consensus on definition of success in ESWL. Some authors define success as absence of stones 6 weeks after ESWL while others define it as absence of fragments of <4mm in three months after ESWL.⁹ The aim of our study is to evaluate outcome of ESWL in kidney stones with density of >750 HU and significance of non-contrast enhanced CT scan for assessment of kidney stones.

MATERIAL METHODS

This descriptive study was conducted in Urology Department of Chanka Medical College Hospital (CMCH) Larkana in the duration of 1st November 2017 to 31st October 2018. Inclusion criteria for the study was patients with solitary renal or ureteric calculi of size 0.5-2cm, stone confirmed by intravenous urography, high intensity renal stones of >750 HU on non-contrast enhanced CT scan, duration of disease must be less than three months. The age of patients must fall in the range of 25-50 years, irrespective of their gender. Patients with inferior calyceal stone or ureteric stone >1cm, having single functioning kidney, existing congenital kidney anomaly, disease requiring stent placement, development of steinstrasse during therapy, coexistent bleeding disorder, patient having BMI of >30kg/ m2 were excluded from the study.

Patients who matched our inclusion criteria were made part of the study. Written and informed consent was taken from every patient before procedure. Pros and cons of the procedure were explained to the patients. It was made sure that patient's identity would be kept anonymous during the whole study. All the data was collected on questionnaire including demographic information, duration of disease; diagnosis, no of ESWL sessions. Statistical analysis was performed using SPSS version 17. All patients

enrolled in the study underwent ESWL under analgesia and sedation. Patients were being sent home and called for follow-up after 12 weeks. After 12 weeks final outcome of ESWL was measured by performing plain X-ray KUB films before and after procedure. Satisfactory outcome was defined as stone clearance in < 3 sessions of ESWL.

RESULTS

According to our inclusion and exclusion criteria 122 patients were selected for ESWL. Among them there were 41.8 (n=51) females and 58.1% (n=71) males. The mean age of the patients was found to be 34.08+ 9.53 years. Approximately more than half of the patients 57.4% (n=70) patients were present in the age group of in ≤35 years. The mean size of the stone was 1.51+ 0.5 cm whereas mean stone density as scan was 772 + 22.2 HU. Patients were having renal or ureteric stones for mean duration of 2.07 + 0.31 months. Around 69.7% of patients had renal stones and 30.3% of patients had ureteric stones. Stone clearance was found in 58.2% (n=71) of the patients. There were 26(21.3%) patients with 2 ESWL sessions, 33(27%) patients with 3 ESWL sessions and 63(51.6%) patients with 4 ESWL sessions. Satisfactory outcome as defined above was found in 52(42.6%) patients.

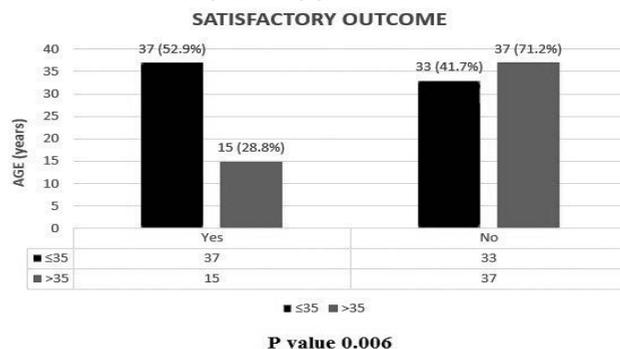


Figure-1. Age and satisfactory outcome n= 122

Stone Size (in cm)	Satisfactory Outcome		Total	P-Value
	Yes	No		
≤1	12 (20.3)	47 (79.7)	59 (100)	0.001
>1	40 (63.5)	23 (36.5)	63 (100)	
Total	52 (42.6)	70 (57.4)	122 (100)	

Table-I. Stone size and satisfactory outcome n= 122

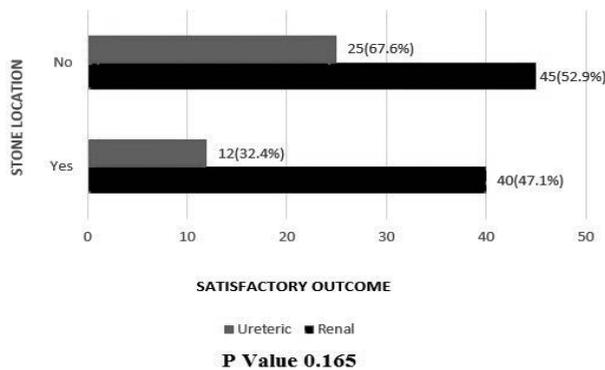


Figure-2. Stone location and satisfactory outcome
n= 122

DISCUSSION

The outcome of lithotripsy is reduced in proportion to the increasing BMI of the patient. Studies have shown that patients having more body fat and skin to stone distance of >10cm show decreased response to ESWL.¹⁴ The results of lithotripsy cannot be compared because the results are somewhat dependent on the operator experience and treatment protocol. Different lithotripters used in ESWL also provide variable outcomes.¹⁵ In our study stone clearance was found in 58.2% of the patients, while 42.6% of the patients showed satisfactory results. A retrospective review done to evaluate treatment outcomes of patients with renal or ureteric calculi patients undergoing general anesthesia had 87% stone clearance rate compared to patients receiving sedation after three months of ESWL. Patients receiving intravenous sedation only had a stone clearance rate of 55% ($p < 0.001$). Hence it shows that treatment outcome was improved after proper analgesic dose.¹⁶ Another study showed that patients undergoing lithotripsy had greater incidence of developing diabetes mellitus and new onset hypertension.¹⁴

A prospective study conducted on stone clearance after ESWL showed that along with age intrarenal resistive index increases and hence stone clearance is decreased in patients aged 60 years or older.¹⁷ In this study patients treated with only ESWL and no surgical intervention were followed on long term by survey and 58.9% patients responded. It was found that there was increased risk of developing hypertension after

ESWL compared to the control group treated conservatively. Patients receiving bilateral ESWL treatment were more prone to develop hypertension in future ($p=0.033$). Also found that patients receiving ESWL therapy developed diabetes mellitus at an earlier age than compared to control group on long term follow-up. The development of diabetes mellitus was also proportional to the number of shocks given and intensity of lithotripter. It is also noted that after ESWL pancreatic enzymes like lipase, amylase are raised up to one week of the procedure in proximal ureteral and renal stones, while no episode of acute pancreatitis was found in lower ureteral stones.¹⁸

According to previous studies conducted CT scan without contrast is one of the most widely used investigation for kidney stones. It predicts the size, density, fragility and possible outcome of lithotripsy; various studies have described its importance for diagnosing any mass in the kidney.¹⁹ As various factors predict outcome of ESWL like age, density of stone, recurrent kidney disease, intensity and number of sessions of lithotripter. There is different success rates (46%-91%) published in different studies according to the long term follow-up.

CONCLUSION

Non-contrast enhanced CT scan is the most frequently used investigation to diagnose kidney stones and decide its treatment modality. Outcome of ESWL also depends on various factors as mentioned in the study.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

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2	Bilal Suria	Drafting of the article, Critical revision of the article for important intellectual content.	
3	Safiullah Sohu	Data collection.	
4	Mumtaz Ali Chandio	Data analysis.	
5	Suhail Dilawar	Literature review and Proof reading.	
6	Mahmood Ahmed Memon	Literature review and referencing.	