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Evaluation of Renal Morphological Changes in Patients Undergoing Extracorporeal Shock Wave Lithotripsy in Normal Sudanese Population

Mohamed E. Osman, Ayman H. E. Abdalgadir, Mohamed E. M. Garelnabi
College of Medical Radiologic Sciences- Sudan University of Science and Technology, Sudan-Khartoum
Corresponding Author: Mohamed E. Osman

Abstract: *Evaluation of Renal Morphological Changes in Patients Undergoing Extracorporeal Shock Wave Lithotripsy in Normal Sudanese Population using a color Duplex ultrasound machine which imaging B-mode imaging, pulsed wave, Duplex scanning and Doppler flow imaging. Were the data consist of 100 patients with kidney lithotripsy and refers for ultrasound before and after lithotripsy procedures.Gray scale and Doppler ultrasound exam were obtained for them using different parameters.*
using analysis of variance using t.test between the gender with age, BMI, volume and resistive index of renal artery were the test showed no significant difference between the gender with BMI, volume and resistive index of renal artery were the p.value was 0.818, 0.202 and 0.564 respectively, and a significant difference with the age were the p.value was 0.012. correlate between volume with age were the rate of volume increase by rate 0.2963 for each year.correlate between volume with body mass index were the rate of volume increase by rate 0.8601 for each kg/m^2.

Keywords: *Morphological Changes, Lithotripsy, Extracorporeal Shock Wave, Resistive index of Renal Artery*

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I. Introduction

Lithotripsy is a medical procedure involving the physical destruction of hardened masses like kidneystones. The term is derived from the Greek words meaning "breaking (or pulverizing) stones" [1].Since its first presentation in West Germany in the early1980s [2], extracorporeal shock wave lithotripsy (ESWL) has revolutionized the treatment of urinary lithiasis. ESWL has gained rapid acceptance worldwide because of its ease of use, noninvasive nature, high efficacy in treating kidney and ureteral stones, and wide availability of lithotripters. ESWL acts via a number of mechanical and dynamic forces on stones such as cavitation, shear, and spalling. The most important force is thought to be cavitation [3]. The destructive forces generated when the cavitation bubbles collapse is responsible for the ultimate stone fragmentation. However, they can also cause trauma to thin-walled vessels in the kidneys and adjacent tissues [4], which result in hemorrhage, release of cytokines/inflammatory cellular mediators, and infiltration of tissue by inflammatory response cells.

Shock wave lithotripsy (SWL) has proven to be a highly effective treatment for the removal of kidney stones. Shock waves (SW's) can be used to break most stone types, and because lithotripsy is the only non-invasive treatment for urinary stones SWL is particularly attractive.

Kidney stone disease is not a simple problem, and there is ample evidence to show that stone formation involves multiple etiologies [5]. Indeed, it is appropriate to refer to specific stone disease entitiessuch as brushite disease or cystine stone disease in comparison for example, two of idiopathic calciumoxalate (CaOx) stone disease [6]. Shock wave lithotripsy (SWL) remains the principal treatment for symptomatic renal calculi despite increasing awareness that SW damage the renal parenchyma [7-11]. Clinical interest in treatment strategies aimed at minimizing the renal damage is high, and manufacturers of second- and theirdegeneration lithotripters have produced machines with higher power and smaller focal zones, ostensibly to enhance stone comminution and diminish injury to renal tissue. Ironically, this combination seems actually to have exacerbated the problem of renal injury caused by SW. The incidence of perirenal hematomas in patients who were treated with the first-generation unmodified Dornier HM3 lithotripter.

This treatment was found to have different acute and chronic complications. Several authors described transient and persistent changes in renal morphology and function. Examinations with scintigraphy, MR imaging, computed tomography (CT), ultrasound (US), different blood and urine laboratory parameters and histopathologic animal studies described damages of the glomerular, tubular and vascular system of the treated and kidneys.A transient decrease in renal perfusion, causing ischemic injury was found in the contralateral (untreated) kidney too [12]. The resistive index (RI) is a non-invasive method and allows for assessment of changes in renal vascular resistance as a result ofvascular compliance [13]. However, the correlation between the RI and renal perfusion decreases in cases of reduced compliance of renal vessels due to several diseases (i.e. atherosclerosis) [14].Knapp et al. [3] described an increase in RI immediately after ESWL, and the most significant increase was found in elderly (older than 60 years).

II. Material and Methods

The studies werecarried out using a color Duplex ultrasound machine capable of B-mode imaging, pulsed wave, Duplex scanning and Doppler flow imaging. The choice of transducer depends on the patient' body habitués and the depth of the kidney to be studied. The examination is preferentially performed with 3-5 MHz curve linear aResistive index of Renal Arteryy transducer. Dornier lithotripter machine used for lithotripsy procedures.Curved linear aResistive index of Renal Arteryy transducers are undoubtedly the best probes to use for the kidneys. They give a good overview with little degradation of the near field. Changing to a linear transducer is essential in case of difficulty of using Curved linear aResistive index of Renal Arteryy transducer. High quality Doppler is important in renal artery indices.

Sample size and type: The sample of this study is of a convenient type, which will consist of 100 patients with kidney lithotripsy and refers for ultrasound before and after lithotripsy procedures.Gray scale and Doppler ultrasound exam was obtained for them using different parameters .A sheet was designed for collection of data from the patients and it include patient information.And established reference value for lithotripsy effects on the kidney. The study will improve gray scale and Doppler ultrasound parameters and indices as a first step in detecting the effects of lithotripsy on the kidney.

III. Results

Table 1. show descriptive Statistics for demographic and measurement information:

	Mean	Std. Deviation	Minimum	Maximum
Age	49.50	16.420	20	80
Height	169.75	11.507	152	186
Weight	66.00	10.316	49	89
BMI	22.80	2.668	19	28
Volume	88.85	20.306	57	122
Resistive index of renal artery	0.658	0.043	0.59	0.78

Table 2. show analysis of variance test for patients parameters:

		Sum of Squares	Df	Mean Square	F	Sig.
Age	Between Groups	1540.833	1	1540.833	7.743	0.012
	Within Groups	3582.167	18	199.009		
	Total	5123.000	19			
BMI	Between Groups	0.408	1	0.408	0.055	0.818
	Within Groups	134.792	18	7.488		
	Total	135.200	19			
Volume	Between Groups	696.008	1	696.008	1.755	0.202
	Within Groups	7138.542	18	396.586		
	Total	7834.550	19			
Resistive index of renal artery	Between Groups	0.001	1	0.001	0.345	0.564
	Within Groups	0.034	18	0.002		
	Total	0.035	19			

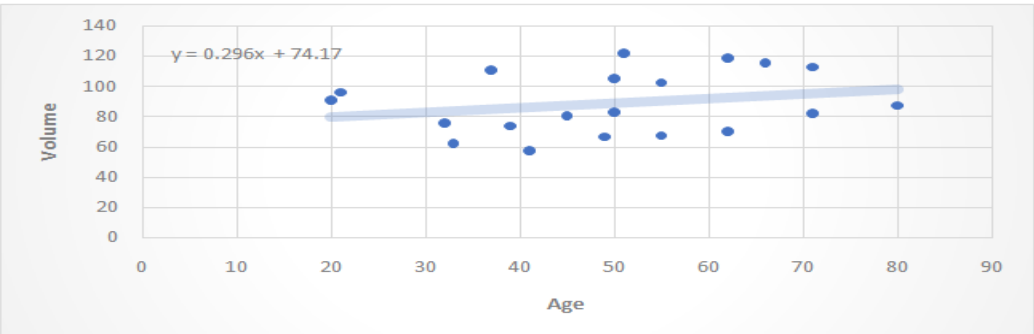

Figure 1. show correlate between volume with age

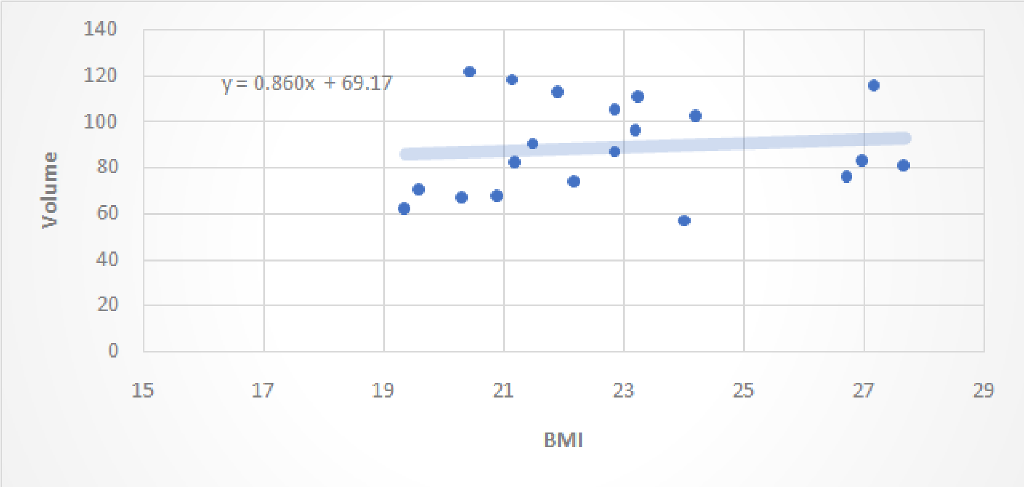

Figure 2. show correlate between volume with body mass index

IV. Discussions

Table 1. show statistical parameters for all patients were presented as mean, standard deviation, minimum and maximum were the mean ± STD for age was 49.50±16.42, high, weight, BMI, volume and resistive index of renal artery was 169.75 ± 11.507, 66 ± 10.32, 22.80 ± 2.67, 88.85 ± 20.31 and 0.66 ± 0.043 respectively.

Table 2. show analysis of variance using t.test between the gender with age, BMI, volume and resistive index of renal artery were the test showed no significant difference between the gender with BMI, volume and resistive index of renal artery were the p.value was 0.818, 0.202 and 0.564 respectively, and a significant difference with the age were the p.value was 0.012.

correlate between volume with age were the rate of volume increase by rate 0.2963 for each year.

correlate between volume with body mass index were the rate of volume increase by rate 0.8601 for each kg/m^2.

V. Conclusion

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Volume = 0.2963 (age) + 74.177

Volume = 0.8601 (kg/m^2) + 69.171

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