IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 10 Ver. 10 (October. 2018), PP 62-65
www.iosrjournals.org

Assessment of kidney morphological changes following lithotripsy using ultrasound in Sudanese population

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Abstract:
Assessment of kidney morphological changes following lithotripsy by ultrasound in Sudanese populationusing a color Duplex ultrasound machine capable of B-mode imaging,pulsed wave, Duplex scanning and Doppler flow imaging, and this study consists of 100 patients with kidney lithotripsy and refers for ultrasound before and after lithotripsy procedures.
Were the results show that the correlate between age group with cortical thickness were the patients with thin cortical thickness was lower than normal cortical thickness with rate 23:58. And the patients with age group 31-40 years was more frequently with 26 patients for both normal and thick cortical thickness and the age group 61-70 years was lower frequently with 10 patients.
Also, correlate between gender with stone location were the upper location was just for male with 4 patients, for middle location the male was 17 and the female 18, for lower location was 31 male patients and 11 female patients. correlate between age group and stone location according to the location for lower stone location was just four patients their age ranges from 31-40 years, and for meddle location the dominant age group was 41-50 years and in lower location the dominant age group was 31-40 years. While correlate between age group with stone shape were 49 patients with solitary and 32 patients with multiple stone, and the patients with age group 31-40 years was more frequently in both solitary and multiple stone 14 and 12 patients respectively.
Using regression equation found that the relation between volume of kidney with patients age were the rate of change for volume was decrease by rate 0.2983 for each year. And the relation between volume of kidney with body mass index were the rate of for the volume increase with rate 0.2922 for each kg/cm^2.
Key words: *morphological changes, lithotripsy, ultrasound*

Date of Submission: 12-10-2018 Date of acceptance: 27-10-2018

I. Introduction:

US provide information about renal length which is used to estimate the renal mass and the presence or absence of hydronephrosis [1]. Renal sinus appears hyperechoic due the sinus fat of PCS which issurrounding the vessels. The main renal artery and vein should not be confused with a mild degree of PCS 6dilatation at the hilum of the kidney [2]. Doppler is helpful in the assessment of intrarenal vessels, the system set to detect low or moderate velocities, flow can be identified in almost all patients, in the vessels at renal hilum, particularly if the angle of incidence is optimized to achieve angles less than 60 relative to the course of vessels [3].Since its appearance at the beginning of the 1980s [4], extracorporeal shock wave lithotripsy (SWL) has been confirmed as the least invasive and the most widely used treatment of kidney and ureteral stones, also in acute conditions [5].Extracorporeal shock wave lithotripsy (SWL) is an effective, minimally invasive treatment option in patients with upper urinary tract calculi. The reported rate of complications associated with SWL varies, primarily as a function of different definitions of complications and types of imaging performed after SWL.

Lesion size, the volume of hemorrhagic tissue in the kidney, increases with SW number and with the power setting of the lithotripter [6-9]. It is often possible to see such trends by gross visual inspection alone, but quantitation of the histologic lesion gives a much better means to localize sites of hemorrhage, and determine the extent of damage. A method that has proven to be both sensitive and objective is to perform in situ perfusion fixation, followed by instillation of the vasculature with pigmented microfil to mark the patent vasculature [10]. The kidney is then embedded whole in paraffin, and serially sectioned at 40 urn. The cut face of the kidney is photographed systematically selected representative sections—and areas of parenchymal hemorrhage are outlined and measured (morphometric segmentation) to determine lesion size.

Historically, ureteric and renal calculi were managed by open surgical techniques. Currently, extracorporeal shock wave lithotripsy (SWL) and ureteroscopy (URS) account for more than 90% of these procedures [11-13]. Although SWL was initially thought to be harmless to the kidney[14,15], subsequent animal

models have demonstrated that the shock waves cause alterations in renal hemodynamics with resultant ischemic injury to the renal tubules and microvasculature [16].

Naturally, like any other treatment, its efficacy is indeed accompanied by some side effects and complications that, despite being generally mild in nature, require accurate evaluation and implementation of measures to prevent them.The main objective of this study to assessment of kidney morphological changes following lithotripsy using ultrasound in Sudanese population.

II. Material and Methods:

The studies were carried 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 array transducer. Dornier lithotripter machine used for lithotripsy procedures.

Method of data collection

Curved linear array 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 array 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 consists 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 statistic for demographic information and measurement of kidney volume for all patients:

	Mean	STD	Min	Max
Age	42.46	13.57	12	68
High	171.22	14.64	125	189
Weight	68.84	13.14	27	95
Volume	113.69	51.17	30	306

Table 2. show correlation between age group with cortical thickness:

Age Group	**Cortical thickness**		**Total**
	Thin	Normal	
19-30	0	15	15
31-40	10	16	26
41-50	7	10	17
51-60	2	11	13
61-70	4	6	10
Total	23	58	81

Table 3. show correlate between gender with stone location:

Gender	**stone location**			Total
	Upper	Middle	Lower	
Male	4	17	31	52
Female	0	18	11	29
Total	4	35	42	81

Table 4. correlate between age group and stone location:

Age Group	**stone location**			**Total**
	Upper	**Meddle**	**Lower**	
19-30	0	9	6	15
31-40	4	7	15	26
41-50	0	11	6	17
51-60	0	4	9	13
61-70	0	4	6	10
Total	4	35	42	81

Table 5. show correlate between age group with stone shape:

Age Group	stone		Total
	solitary	multiple	
19-30	9	6	15
31-40	14	12	26
41-50	9	8	17
51-60	9	4	13
61-70	8	2	10
Total	49	32	81

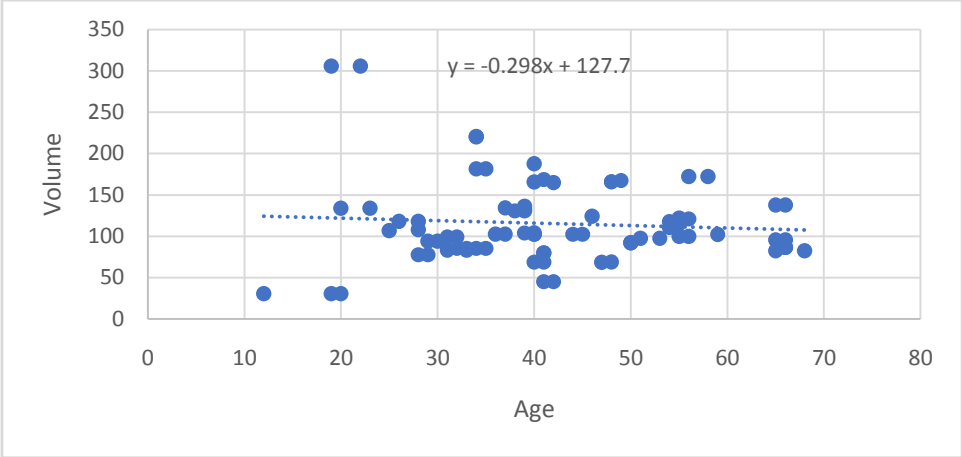

Fig 1. Show correlate volume of kidney with patients age

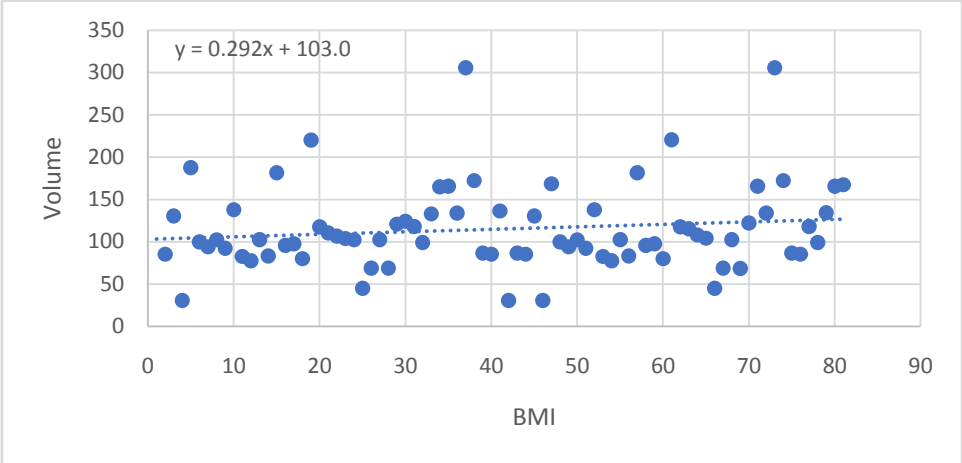

Fig 2. Correlate volume of kidney with body mass index

IV. Discussions:

Table 1. show descriptive statistic for demographic information and measurement of kidney volume for all patients were the data presented as mean, standard deviation, minimum and maximum. Were the mean ± STD for age was 42.46±13.57, for high, weight and kidney volume was 171.22 ± 14.64, 68.84±13.14 and 113.69±51.17 respectively.

Table 2. show correlation between age group with cortical thickness were the patients with thin cortical thickness was lower than normal cortical thickness with rate 23:58. And the patients with age group 31-40 years was more frequently with 26 patients for both normal and thick cortical thickness and the age group 61-70 years was lower frequently with 10 patients.

Table 3. show correlate between gender with stone location were the upper location was just for male with 4 patients, for middle location the male was 17 and the female 18, for lower location was 31 male patients and 11 female patients.

Table 4. correlate between age group and stone location according to the location for lower stone location was just four patients their age ranges from 31-40 years, and for meddle location the dominant age group was 41-50 years and in lower location the dominant age group was 31-40 years.

Table 5. show correlate between age group with stone shape were 49 patients with solitary and 32 patients with multiple stone, and the patients with age group 31-40 years was more frequently in both solitary and multiple stone 14 and 12 patients respectively.

Correlation between volume of kidney with patients age were the rate of change for volume was decrease by rate 0.2983 for each year **fig1**.Correlate volume of kidney with body mass index were the rate of for the volume increase with rate 0.2922 for each kg/cm^2**Fig 2.**

V. Conclusion:

Assessment of kidney morphological changes following lithotripsy using ultrasound in Sudanese populationusing a color Duplex ultrasound machine capable of B-mode imaging,pulsed wave, Duplex scanning and Doppler flow imaging, and this study consists of 100 patients with kidney lithotripsy and refers for ultrasound before and after lithotripsy procedures.

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Using regression equation found that the relation between volume of kidney with patients age were the rate of change for volume was decrease by rate 0.2983 for each year. And the relation between volume of kidney with body mass index were the rate of for the volume increase with rate 0.2922 for each kg/cm^2. *And the volume can be estimated from patients age and body mass index using linear equations as shown below:*

$$Volume = 0.2922\ (Kg/cm^2) + 103.02$$

$$Volume = -\ 0.2983\ (year) + 127.72$$

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