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Research Article

Ultrasonographic Renal Size in Individuals with Known Diabetes Mellitus

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Abstract: Diabetes mellitus (DM) is becoming a major out-break in developed country. Renal ultrasonography is standard imaging modality in the investigation of kidneys. The study aimed to establish preliminary data for Sudanese population kidney dimensions in individuals with known Diabetes Mellitus (DM) using ultrasound .Ultrasonographic kidney measurements were performed for 205 patients with known DM. Measurements included length, width, corticomedullary differentiation. The effect of age, gender, onset, renal parenchymal disease and pyelonephritis was statistically analyzed. There was association between renal length renal failure, renal parenchymal disease and pyelonephritis (P= 0.000, 0.429 and 0.068 respectively. relation was statistically significant since P<0.05. The study proved that diabetic patients were subject to multiple changes in kidneys that can be diagnosed by ultrasound; this supports the use of ultrasound in diabetic treatment units. Using ultrasonography routinely in the unit of treatment of diabetes disease and follow up patients with diabetes is well recommended; also researches could constitute a base for further research in this field.
Keywords: Diabetic Mellitus, Sonography, Patient,Kidney Measurement

INTRODUCTION

Diabetes mellitus (DM) is becoming a major out-break in our community affecting both adult and young people and even children. DM is a destructive disease, causing not only ill-health but affect both the economy, and the psychology of the patient. Hence any tool that can be used in the diagnosis, treatment, and management is very helpful. Ultrasound is one of the modality that can be used in such diseases. DM is a condition in which the body either does not produce enough, or does not properly respond to, insulin, a hormone produced in the pancreas [1].

Diabetic nephropathy is kidney disease that is a complication of diabetes. Diabetic nephropathy is caused by damage to the tiniest blood vessels. When small blood vessels begin damaged, both kidneys begin to leak proteins into the urine. As damage to the blood vessels continues, the kidneys gradually lose their ability to remove waste products from the blood [2].

Renal ultrasonography has become the standard imaging modality in the investigation of kidneys. Renal size and location can be determined. Solid tumors can be detected and distinguished from renal cysts. Ultrasonography can detect nephrolithiasis and hydronephrosis. Post renal failure can usually be easily differentiated from prerenal or intrarenal acute renal failure. Renal tumors, from a certain size upwards are also readily detectable [3].

Ultrasonography today is established method for the initial evaluation of kidneys. The ready availability of this method allows rapid diagnosis and therapeutic decisions, which is of extreme importance to keep in hospital time low [4].

The study aimed to establish preliminary data for Sudanese population kidney dimensions in individuals with known Diabetes Mellitus (DM) using ultrasound.

MATERIAL AND METHODS

Ultrasound Equipment

This study was performed using different ultrasound scanners available at the areas of study such as Aloka prosound SSD 4000 (Aloka holding Europe AG, Switzerland), Toshiba Nemio 20 (Toshiba, Japan), Siemens sonoline G60S (Siemens, USA), and Shimadzu SBU 2200 (Shimadzu Europe GmbH, Germany). All of these scanners drive convex probes produce a frequency of 3.5 MHz; also they were connected with printing facility through digital graphic printer (Mitsubishi Corporation, Japan).

Sample Size

Two hundred and five samples of Sudanese diabetic patients between the ages of 28 to 96 years were selected according to the positive evidence of diabetes, among the outflow of the patients in two ultrasound departments at National Ribat University Hospital,

Renal Transplant Hospital (Khartoum North) at Khartoum State, Sudan.

Testing Procedure (Protocol)

The patient**s** were told to prepare themselves carefully for the scan by abstaining from food for the last 6 hours prior to investigation with continuous taking their drugs, imposing dietary restrictions, walking for 30 min before the examination, water contrast [5].

Usually the examination was carried out with the patient in supine position. Additional scans in the lateral decubitus and prone were useful in some situations. A coupling agent gel was used to ensure good acoustic contact between the transducer and the skin [5]. After informing the patients about the procedure and obtaining verbal consent from each of them, the area of interest in the abdomen was completely evaluated in at least two scanning planes. Surveys were used to set correct imaging techniques, to rule out pathologies, and to recognize any normal variants [4].

Statistical Analysis Used

The data was analyzed using STATA8. The associations between the conclusion's different results and the body measurement are tested using chi-square test; level of significant 0.05 was used.

RESULTS AND DISCUSSION

The patients were distributed into three categories; the first group included those who had small right kidney, they were 44 patients and the percentage of them was (22.4%), for the left kidney they were 42 patients and the percentage of them was (20.5%), the second group include those who had normal right renal length was 155 patients, the percentage of them was (75.6%) and the percentage was the same for the left kidney, the third group for those who had large kidney size were 8 patients, the percentage was (3.9%) while there were 4 had large left kidney and the percentage was (2%) Table 3 and 4. Using chi squire test there was association between Renal length, renal failure, renal parenchymal disease and pyelonephritis (P= 0.000, 0.429 and 0.068 respectively relation was statistically significant since P<0.05, the cross tabulation showed that (P= 0.02 for Rt kidney and 0.014 for the Lt kidney, 0.000 for Rt kidney and 0.005, for the Lt kidney 0.386 for Rt kidney and 0.411for the Lt kidney, 0.012 for Rt kidney and 0.007 for the Lt kidney and 0.000 for both kidneys) the relation was statistically significant since P<0.05 Table 5 and 6. This matches with University Hospital Merkur [6] they found that in asymptomatic diabetic nephropathy, renal length and parenchymal thickness were significantly increased compared to that of controls, reflecting hyper filtration-induced nephromegaly. Also matches with Banholzer *et al.* [7] they found that in 231 male and 220 females' normal junior and senior high school age adolescents 12 and 20 years. Kidneys grew in correlation with the age, height and body weight. According to kidney width patients were distributed into three category; those who had small right kidney, were 42 patients and the percentage of them was (20.5%) and for the left kidney there was 31 patients and the percentage of them of them was (15.1%), those who had normal right renal width was 161 patients, the percentage of them was (78.5%) while the percentage for the left kidney was(83.9%), those who had large right kidney width were 2 patients, the percentage was (1%) and the percentage was the same for the left kidney width. Using chi square test there was association between renal size in diabetic patient who had pyelonephritis and normal finding Table 7 , this was matches with University Hospital Merkur, 1997 [6] they found that in asymptomatic diabetic nephropathy, renal length and parenchymal thickness were significantly increased compared to that of controls, reflecting hyperfiltration-induced nephromegaly.

Table 1 Distribution of patients' gender

Gender	Frequency	Percent
Male	76	37%
Female	129	63%
Total	205	100%

Table 1 Distribution of patients' age

Age groups	Frequency	Percent
First childhood	1	0.5%
Adolescent age	5	2.4%
Conscious stage	18	8.8%
Young Stage	121	59.0%
Elderly stage	44	21.5%
Senility	16	7.8%
Total	205	100.0%

Table 3 Distribution of patients' right kidney length

Right kidney length	Frequency	Percent
Small (Less than 8.5cm)	46	22.4%
Normal (between 8,5 to 12.5cm)	155	75.6%
Large (more than 12.5cm)	4	2.0%
Total	205	100.0%

Table 4. Distribution of patients' left kidney length

Left kidney length	Frequency	Percent
Small (Less than 8.5cm)	42	20.5%
Normal (between 8,5 to 12.5cm)	155	75.6%
Large (more than 12.5cm)	8	3.9%
Total	205	100.0%

Table 5 Distribution of cross tabulation between variables

Variables	Renal Failure	R.F+ R. Parenchymal disease
Right kidney length	<0.000	0.167
Left kidney length	<0.000	0.001
Patient shape	0.084	0.149
Onset	<0.000	0.49

Table 6 Distribution of correlation between variables

Variable	**Right kidney length**		**Left kidney length**	
	Correlation factor	sig	Correlation factor	sig
Age	-0.271	<0.000	-0.194	0.005
Patient Shape	0.232	0.001	0.235	0.001
Patient Highest	0.031	0.662	0.137	0.05
Onset of Diabetes	-0.136	0.052	-0.177	0.011

Table 7 Distribution of relation between variables

Conclusion	Patient Shape	Treatment taken	Creatinine Level	Blood Urea Level	Kidney's Echogenicity	Rt kidney width	LT kidney width	RTkidney length	Lt kidney length
Renal Failure	0.084	0.001	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000	<0.000
Renal Parenchymal disease	0.494	1	1	1	0.124	1	1	0.429	1
R.F+R. Parenchymal disease	0.149	0.435	0.004	0.004	<0.000	0.106	0.208	0.167	0.001
Pyelonephritis	0.793	0.019	0.089	0.08	0.004	1	1	0.068	0.121
Pyelitis	1	0.429	1	1	1	1	1	1	1

CONCLUSION

Renal changes in diabetic patients are detectable by conventional ultrasound only in very advanced stages of the disease. Pathologic resistive indices, however, may be detected in the earlier stages. Even later in life, combined lifestyle factors are associated with a markedly lower incidence of new-onset diabetes mellitus. Intensive therapy effectively delays the onset and slows the progression of diabetic retinopathy, nephropathy, and neuropathy in patients with IDDM. Diabetes is the most prevalent diseases in the world WHO expects that the number of infected will increase from 200 million to 2.5 million by 2010, despite the seriousness of this disease and rapidly spread it ranks seventh in the list of causes of death and is responsible for one third of cases leading to renal failure and cardiovascular disease are known to most people with diabetes die from heart attacks.

Recommendations

Because the researches carried for abdominal ultrasound findings of diabetic patients in Sudan were not enough, there should be more concentration on using ultrasound as a useful diagnostic tool of research in diabetic patients more details, findings, and highlighting hidden information, therefore more centers to cover the country.

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