an University of Science and Techno

College of Graduate Studies

Characterization of Diabetic Nephropathy Using Ultrasonography

توصيف مرضي الكلي المصابين بالسكري باستخدام التصوير بالموجات فوق الصوتية

A thesis submitted for partial fulfillment of the requirement of MSc in Medical Diagnostic Ultrasound

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الآية

بسم الله الرحمن الرحيم

: قال تعالى

تبارك الذي بيده الملك وهو على كل شئ قدير* الذي خلق الموت والحياة)

ليبلوكم أيكم أحسن عملا وهو العزيز الغفور) صدق الله العظيم

سورة تبارك الآية 1-2

Dedication

To my parents

My husband

To my kids

shahd &yousuf

To my

friends

To my

colleagues

Acknowledgments

First I would like to thanks our God for enabling me to complete this thesis.

I give my great pleasure to my supervisor Dr**. Ikhlass abdelaziz hassan** for her continuous helping, guiding and supervision.

Am also deeply grateful to **Dr. Mostafa Alameen and Dr. Mohmed Ezz Alarab .**

Am also very grateful to many individuals who played a part in preparing this work.

Abstract

In fact diabetes is most common cause of kidney failure. The purpose of study is characterized of diabetic patient kidney using ultrasound.

This study was been done in U/S department at soba university hospital from march (2016) to august (2016).

The study was done for 37 diabetic patients (13 of them have type I and 24 type II) for more than 5 year`s their ages over 30 years.

In this study ultrasound was performed for all patients by measuring the size of kidney and evaluated the echogenicity of the right kidney compared with the liver, while the echogenicity of the left kidney was compared with spleen and corticomedullary ratio was measured also. The ultrasound scan done by using transabdominal curve linear probe 3.5 MHz.

The study conclude that there was decreasing in both kidneys volume (116 cm3 _125cm3) and increasing in C/M ratio and no significant different in echogenicity when comparing with previous study.

مستخلص الدراسة

يعتبر داء السكري من الأسباب الشائعة للفشل الكلوي.هدفت هذه الدراسة إلي . توصيف خصائص الكلى لدى مرضى السكري بواسطة الموجات فوق الصوتية اجريت هذه الدراسة بقسم الموجات الصوتية في مستشفي سوبا الجامعي في الفترة من مارس 2016 حتي اغسطس 2016.

شملت هذه الدراسة 37 شخص مصاب بمرض السكري (منهم 13 شخص مصابون بالنوع الأول 24 شخص من النوع الثاني) لأكثر من خمس سنوات, تزيد أعمارهم عن 30 عاما . وقد تم استبعاد مرضى السكري المصابين بعيوب خلقيه في الكلى أو انسداد المجرى البولي أو أورام الكلى.

اعتمدت الدراسة على قياس حجم الكلى وقياس النسبة بين قشرة ونخاع الكلى بالإضافة لمعدل الصدى الراجع مقارنة بالصدى الراجع من الكبد بالنسبة للكلية اليمنى والصدى الراجع من الطحال بالنسبة للكلية اليسرى, كذلك قياس النسبة بين طبقة القشرة والنخاع في الكلى.وقد اجري الفحص باستخدام مسبار البطن بواسطة جهاز الموجات فوق الصوتية بتردد 3.5 ميقا هرتز

وقد خلصت هذه الدراسة الي وجود نقص في حجم الكلى(116سم 3) للكلية اليمين و (125سم 3) للكلية اليسار وزيادة في النسبة بين طبقة القشرة والنخاع في الكلي اليمين واليسار (74, 72)بينما لا يوجد تغير كبير في معدل الصدى الراجع من الكبد والطحال مقارنة بالدراسات السابقة.

List of tables

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List of Abbreviation

CKD	Chronic kidney disease.
C/M ratio	Cortico-medullary ratio.
DM	Diabetes mellitus.
DN	Diabetic nephropathy.
IDDM	Insulin dependent diabetes mellitus.
NIDDM	Non Insulin dependent diabetes mellitus
RBF	Renal blood flow

TA U/S	Transabdominal ultrasound.

Table of Contents

CHAPTER ONE
Introduction

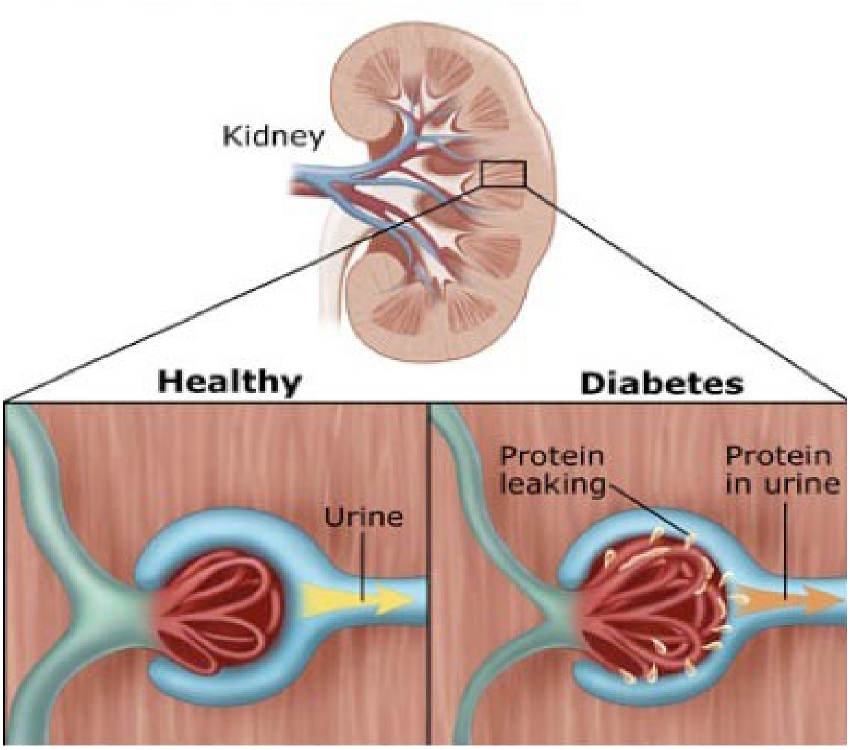
Chapter one: Introduction

1.1 Introduction

The term diabetes mellitus describes a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both. The effects of diabetes mellitus include long term damage, dysfunction and failure of various organs. Diabetes mellitus may present with characteristic symptoms such as thirst, polyuria, blurring of vision, and weight loss. Several pathogenic processes are involved in the development of diabetes. These include processes which destroy the beta cells of the pancreas with consequent insulin deficiency, and others that result in resistance to insulin action. The abnormalities of carbohydrate, fat and protein metabolism are due to deficient action of insulin on target tissues resulting from insensitivity or lack of insulin.(National Diabetes Data Group2016)

There are two main types of diabetes: type 1 diabetes due to pancreatic islet beta–cell destruction, body failure to produce insulin .Insulin requiring for survival(corresponding to the former clinical class of Insulin Dependent Diabetes Mellitus – IDDM).type 2 diabetes is the most common form of diabetes and is characterized by disorders of insulin action and insulin, Not insulin requiring, i.e. those who may be controlled satisfactorily by non–pharmacological methods or drugs other than insulin(corresponding to the former clinical class of Noninsulin Dependent Diabetes Mellitus NIDDM. Gestational diabetes is carbohydrate intolerance resulting in hyperglycemia of variable severity with onset or first recognition during pregnancy.

Diabetes is the most common cause of chronic kidney disease. Over a long period of time diabetes causes damage to the filters in the kidney. As the kidneys get more damaged they are not able to clean or filter the blood properly Fig (1.1). (Gardner 2011)



Fig(1.1):Shown Bowman`s capsule of healthy and diabetic person

More than 40% of persons with diabetes have elevated urinary albumin excretion, and the prevalence is higher in those with diabetes of longer duration. In insulin-dependent diabetes mellitus (IDDM), the incidence of persistent proteinuria rises during the first10 years of diabetes and begins to decline after ~10 years of diabetes. Diabetic renal disease is more common in some families than in others, suggesting differences in genetic susceptibility. Other factors associated with the development of diabetic nephropathy include diabetes duration, hypertension, hyperglycemia, and smoking. Increased plasma protein activity, lipoprotein abnormalities, autonomic neuropathy, pregnancy, a high protein diet, and drug nephrotoxicity have been implicated as risk factors in some studies.

1.2Problem

Diabetes is most common cause of kidney failure which can lead to heamodialysis or renal transplant that can be prevented by monitoring the early renal change using Ultrasonography.

1.3 Objectives

1.3.1 General objective:

- To characterize diabetic nephropathy using ultrasound.

1.3.2 Specific objectives:

- To measure the volume of diabetic patient kidney.
- To assess their cortico /medullary ratio.
- To correlate the duration of kidney disease with U/S findings.
- To evaluate the echogenicity of the renal cortex in comparison with the liver and spleen.

1.4 Over view of the study

This study fall into five chapters

Chapter one: Are the introduction, problem and objectives.

Chapter two: literature review.

Chapter three: material and method.

Chapter four: deal with data presentation and data analysis (Result)

Chapter five: contain discussion of the result, conclusion and recommendation

CHAPTER TWO

Literature review

Chapter two: literature review

2.1 theoretical backgrounds

2.1.1Anatomy of Kidney:

The kidneys are paired organs located on the posterior abdominal wall outside the peritoneal cavity. They lie on either side of the vertebral column with their upper and lower poles extending from the twelfth thoracic to the third lumbar vertebrae. Each kidney is approximately 11-12 cm long, 5 to 6 cm wide, and 3 to 4 cm thick. A tightly adhering capsule (the renal capsule) surrounds each kidney, and the kidney then is embedded in a mass of fat. The capsule and fatty layer are covered with a double layer of renal fascia, fibrous tissue that attaches the kidney to the posterior abdominal wall. The cushion of fat and the position of the kidney between the abdominal organs and muscles of the back protect it from trauma. The right kidney is slightly lower than the left; it is displaced downward by the overlying liver. A medial indentation (the hilum) contains the entry and exit for the renal blood vessels, nerves, lymphatic vessels, and ureter.(Mogensen, Christensen e tal 1983)

The gross structure of the kidney can be identified when it is divided from top to bottom in a coronal plane. The major components are the outer renal cortex and the inner renal medulla. The cortex contains all the glomeruli and portions of the tubules. The medulla consists of a series of wedges, called renal pyramids, with an outer zone close to the cortex and an inner zone. Renal columns extend from the cortex down between the renal pyramids. The apices of the pyramids project into a minor calyx (a cup-shaped cavity), which joins together to form a major calyx. The major calyces join to form the renal pelvis, an extension of the upper end of the ureter Fig (2.1).

The renal artery supplying the kidney which is branch of aorta and divided into several segmental branches within the renal sinus. Some branches go posterior to the pelvis while others go anterior to the pelvis. The inter lobar arteries enter the parenchyma through the renal columns and extend to the bases of the pyramids. At the junction of the cortex with the medulla the vessel arches across the base of the pyramid. This is known as the arcuate artery**.** It gives off branches called the interlobular arteries which supply the majority of the cortical nephrons via afferent arterioles.In summary, interlobar arteries run through the renal columns and become arcuate arteries as they run between the cortex and medulla at the base of the pyramids. The arcuate arteries give rise to the interlobular arteries which extend through the cortex as far as the capsule. The nephrons are supplied by afferent arterioles which are branches of the interlobular arteries**.** **(**Mogensen, Christensen, e tal 1983)

Venae rectae vessels drain the nephrons and coalesce to form the arcuate vein. Other small venules flow into the interlobular vein which in turn drains into the arcuate vein. The remainder of the venous drainage of the kidney corresponds to the arteries. The venous blood flow is of course in the opposite direction to the arterial flow**.**(Mogensen, Christensen etal1983)

Supplementary Vessels are formed when the main renal arteries are solitary in 60% of individuals and multiple and smaller in the remainder. Renal arteries are more commonly multiple when the kidney is malpositioned or malrotated. Supplemental renal arteries may course directly into the polar regions of the kidney without coursing through the renal hilum. Renal veins are usually solitary.

Lymphatic drainage of the kidneys is to lumbar nodes. The renal plexus is formed from the rami of the celiac ganglion and plexus, the aorticorenal ganglion, lower thorathic splanchnic nerves, 1stlumbar splanchnic nerve, aortic plexus and renal plexus usually continue into the kidney around the renal arteries.(Mogensen, Christense etal 1983)

The kidney is formed of two layers. The outer layer is the cortex that contains glomeruli, proximal tubules, cortical portions of loops of henle, distal tubules and cortical collecting ducts. The inner layer or medulla is comprised of renal pyramids. The pyramids contain medullary portions of loops of henle and medullary portions of collecting ducts. Multiple pyramids taper and join together, forming a minor calyx. Several combined minor ones make a major calyx. The major calyces join and enter a funnel shaped renal pelvis that directs urine into the ureter Fig (2.1).Approximately one kidney comprised of one million nephrons.

The nephron consists of glomerulus, Bowman`s capsule, proximal convoluted tubule, loop of Henle, distal convoluted tubule and collecting duct Fig (2.2).

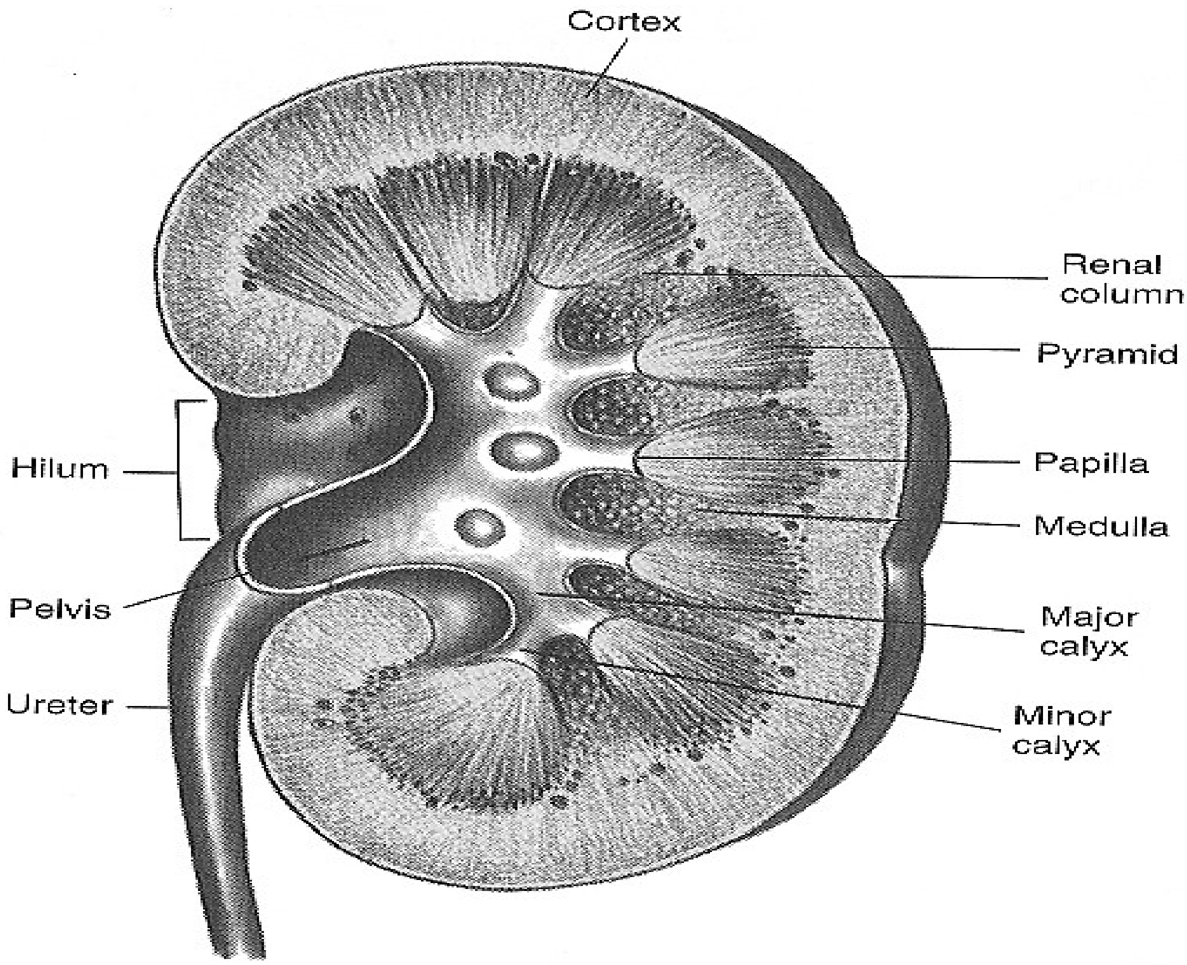
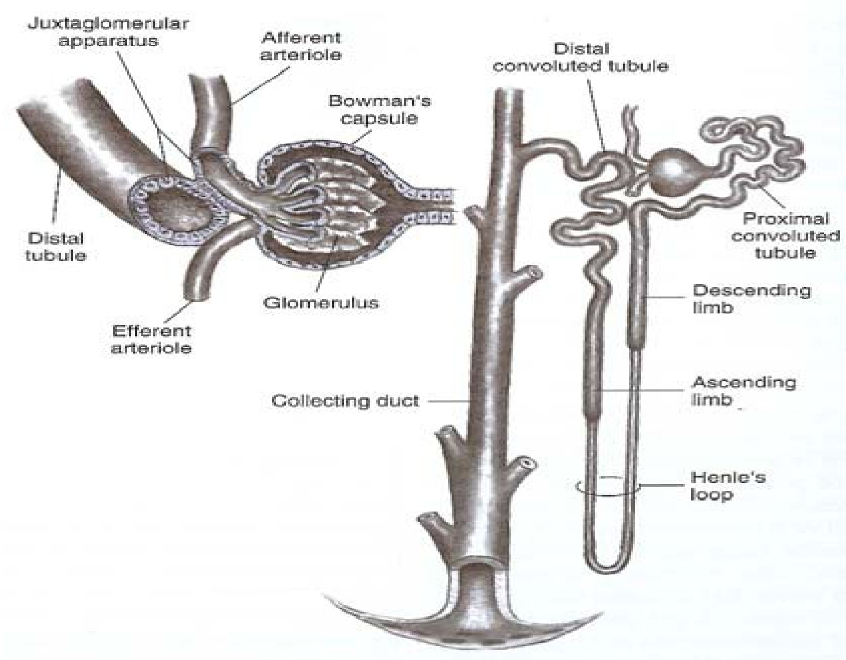


Fig (2.1): Cross section of kidney.



Fig(2.2) Shows: Components of the nephron.

Physiologically the kidneys are highly vascular organs and usually receive 1000 to 1200 ml of blood per minute, or about 20% to *25%* of the cardiac output. With a normal hematocrit of 45%, about 600 to 700 ml of blood flowing through the kidney per minute is plasma. From the renal plasma flow, 20% (approximately 120 to 140 ml/min) is filtered at the glomerulus and passes into Bowman`s capsule. The filtration of the plasma per unit of time is known as the glomerularfiltrationrate(GFR), and the GFR is directly related to the perfusion pressure in the glomerular capillaries. Blood flow to the kidneys is regulated by autoregulation:a local mechanism within the kidney that tends to keep the rate of blood flow and GFR fairly constant over a range of arterial pressures between 80 and 180 mmHg.Neural regulation: the sympathetic nervous system innervates the kidney and regulates RBF related to systemic arterial pressure. When systemic pressure decreases, RBF decreases. This reduced blood

flow reduces GFR and diminishes the excretion of sodium and water, promoting an increase in blood volume and thus an increase in systemic pressure, hormonal regulation: Hormonal factors can alter the resistance of the renal vasculature by stimulating
vasodilatation or vasoconstriction. A major hormonal regulator of RBF is the renin-angiotensinsystem, which can increase systemic arterial pressure and change RBF.

Urine is the fluid secreted from the blood by the kidneys. Normal urine is 95% water but also contains urea, sodium, chloride, creatinine, and other organic and inorganic substances in minute amounts. Urine is produced by Glomerular filtration: filtration of the blood through the epithelial walls of the glomerulus produces glomerular filtrate. Tubular reabsorption:a process where much of the glomerular filtrate passes out of the nephron tubule and returns to the blood. As much as 99% of material in the filtrate is returned to the blood. Tubular secretion:substances not removed from the blood during glomerular filtration are transported from the peritubular capillaries directly into the nephron tubule.

Ions removed from the blood by tubular secretion include: potassium, hydrogen,and ammonium. The secretion of hydrogen ions is important in maintaining blood pH. Other molecules secreted include: food preservatives, pesticides, medications, and creatinine.arijuana, cocaine, heroin, and other drugs are also removed by tubular secretion, which makes it possible to perform urine drug testing .(Alexa K. Doig and Sue E. Huether2013)

InLabtest (creatinine and urea), creatinine is a nitrogenous compound formed as an end product of muscle metabolism. It is formed in muscle in relatively small amounts, passed into the blood and excreted in the urine. Blood creatinine level measures renal function. Normally it is produced in regular consistently small amounts. Therefore an elevation means a disturbance in renal function. Renal impairment is virtually the only cause of creatinine elevation.(Mogensen, Christensen etal1983)

Urea is an end product of protein metabolism and is readily excreted by the kidneys. Therefore the blood urea concentration normally is fairly low. Blood urea nitrogen level measures renal function. The BUN level rises when the kidney's ability to excrete urea is impaired. It also rises with reduced renal blood flow as with dehydration and urinary tract obstructions. An elevated level of BUN may lead to mental confusion, disorientation and coma.. (Mogensen, Christensen, etal 1983)

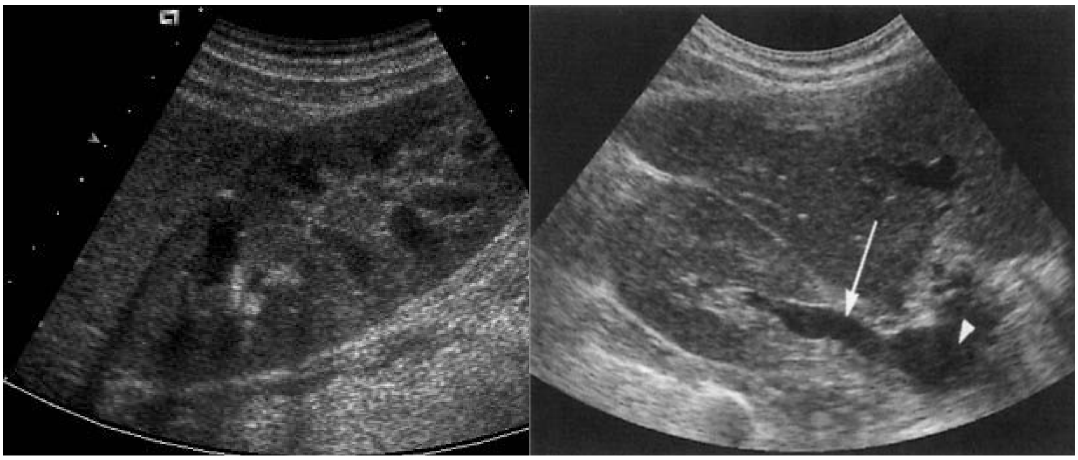
2.1.2 Radiological investigations:

The role of U/S in diagnosis of kidneys diseases as well as all types of imaging techniques CT, magnetic resonance (MR), scintigraphy, positron emission tomography(PET) can provide useful information about kidney structure, urinary tract status, the presence of obstruction on the state of inflammation and the presence of edema of the renal parenchyma and vasculature. However, the use of some of these medical procedures to carry out characterization or diagnosis diseases and subsequent follow-up is not always possible. In particular the use of iodinated contrast with CT and gadolinium with MRI could potentiate allergic and toxic effects in patients with a significant reduction in GFR. US examinations usually concern the ability to identify a pathological condition, to distinguish between different histopathological lesions, and to identify patients with end-stage chronic renal failure. The parameters are morphological (interpolar and anteroposterior diameter, parenchymal thickness, and echogenicity). Two-dimensional (B-mode) grey scale renal US is the imaging technique most commonly used in the differential diagnosis between acute and chronic kidney disease. It is a very good method for investigating a wide range of renal tract abnormalities. It’s easy to access for nephrologists and intensivists, simple to use, with no complications, well tolerated and can be performed at the patient bedside. It is a safe, fast, non-invasive and low-cost test. Elementary information given by B-mode renal US includes kidney size, cortical echogenicity, parenchymal thickness, corticomedullary differentiation, renal profiles and the state of urinary tract, and characterizing the structure of renal parenchyma.(Devin Dean 2005)

2.1.3Ultrasound technique of the kidney:

At the beginning, the patient is being examined while lying on the back. The longitudinal axis is being searched for in the so-called edge-cut, meaning a section which runs from dorsal cranial to ventral caudal as well as from medial cranial to caudal lateral. The kidney is first being measured in longitudinal cuts and is being subsequently examined in the short axis or in cross cuts. The ribs can sometimes be in the way of showing a clean cross section. In such a case, it is recommended to find a space between the ribs and to let the patient breathe deeply. Thereby, the whole kidney can be examined properly and in detail. The kidney sinus is being examined most easily while patients lie prone, which is valid for both children and adults. This position proves in most cases successful to show both the renal pelvis and the outlet of the ureter. Sometimes the kidneys are positioned quite high, the left kidney can be directly subphrenic. In such a case, the examination in a standing position proves most sensible. This can also lead to the observation of a floating kidney (decrease of the kidney of > 5cm in standing). It is important to observe the respiratory displace ability of the kidney and to compare it with the respiratory displace ability of the liver (and the spleen on the left side) and the psoas muscles. Using high frequency transducer for adequate penetration range (3 – 5) MHz.(Glann J K.2002)

The Normal U/S appearance of kidneys structures begins with the cortex of the normal kidney is slightly hypoechoic when compared to the adjacent liver parenchyma, although this is age-dependent. In young people it may be of similar echogenicity and in the elderly it is not unusual for it to be comparatively hyper echoic and thin. The medullary pyramids are seen as regularly spaced, echo-poor triangular structures between the cortex and the renal sinus Fig (4).The tiny reflective structures often seen at the margins of the pyramids are echoes from the arcuate arteries which branch around the pyramids. The renal sinus containing the PCS is hyper echoic due to sinus fat which surrounds the vessels. The main artery and vein can be readily demonstrated at the renal hilum and should not be confused with a mild degree of PCS dilatation. Color Doppler can help to differentiate between dilated pelvic of kidney and blood vessels.(Henke K 2003)



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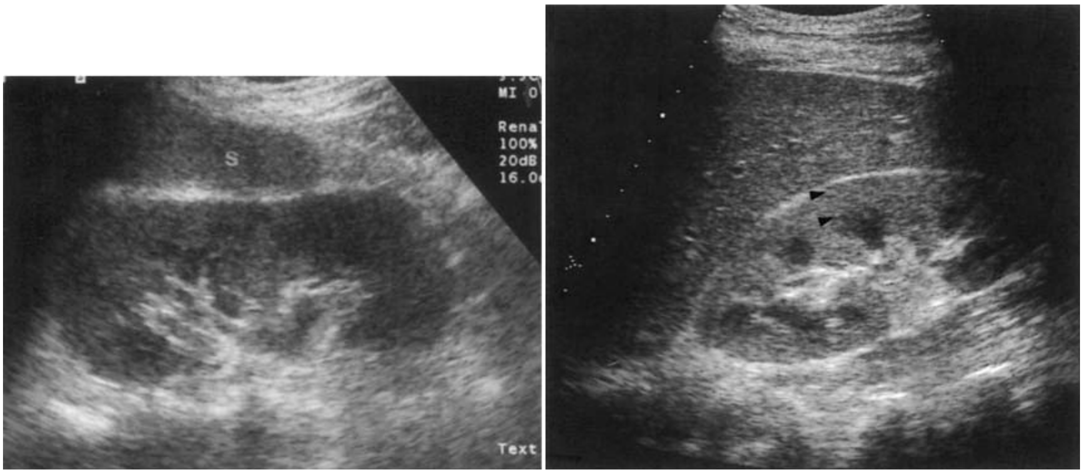

C D

Figure (2.3):(A) Sagittal section through the normal right kidney (RK), using the liver as an acoustic window. The central echoes from the renal sinus are hyper echoic due to the fat content. The hypoechoic, triangular, medullary pyramids are demonstrated in a regular arrangement around the sinus. The cortex is of similar echogenicity to the liver.(B) TS through the hilum of the RK, demonstrating the renal vein (arrow) draining into the inferior vena cava (IVC) (arrowhead). (C) Left kidney (LK) in coronal section. The renal hilum is seen furthest from the transducer (s = spleen).(Compare this with the *sagittal* section of the RK in which cortex is seen all the way around the pelvicalyceal system.) (D) The renal cortex lies between the capsule and the lateral margin of the medullary pyramid (arrowheads).

The normal kidney length measurement is9-12cm (measured in longitudinal section).Width 4 –6cm (measured in cross section) Depth 4-6cm (measured in cross section).The parenchymal thickness (p) is being measured from the tip of the mark pyramid unto the surface of the kidney. The normal parenchyma thickness consists of 14-18mm.The parenchyma thickness can be used as a parameter of course, but the measurement should always be carried out on the same place, at the same papilla Fig (2.5). This is particularly important while monitoring a transplanted kidney, but should be also being taken into account while controlling the process of chronically diffuse diseases of the parenchyma. The cortical thickness is being measured from the border of kidney mark to kidney cortex surface . The normal cortical thickness consists of 8-10mm.Narrowings can be found during chronic diseases of the parenchyma with kidney insufficiency**.**(Seeliger E et al.2009)(Claudon M, Cosgrove D, Albrecht T et al 2008)

Parenchymal echogenicity is the most frequently used marker for evaluating the presence of nephropathy. It is evaluated by comparing the echogenicity of the renal cortex, medulla and pelvic sinus with that of the adjacent liver and spleen (assuming that the liver and spleen present normal echogenicity). Renal echogenicity is divided into four different grades from 0 to III Fig (2.6**)**(Bates JA**2004**)

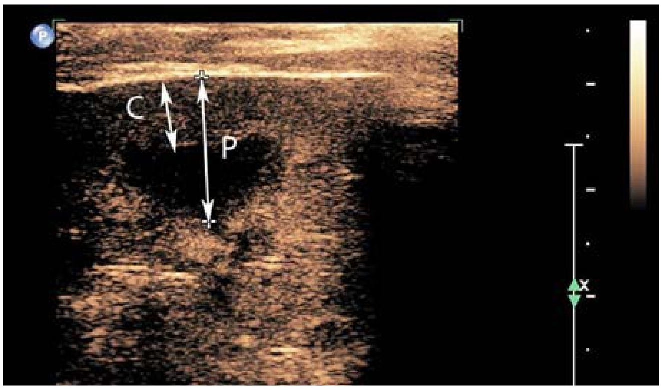

Fig (2.4): Measurement of renal parenchyma, Parenchyma thickness (p),cortical thickness(c).

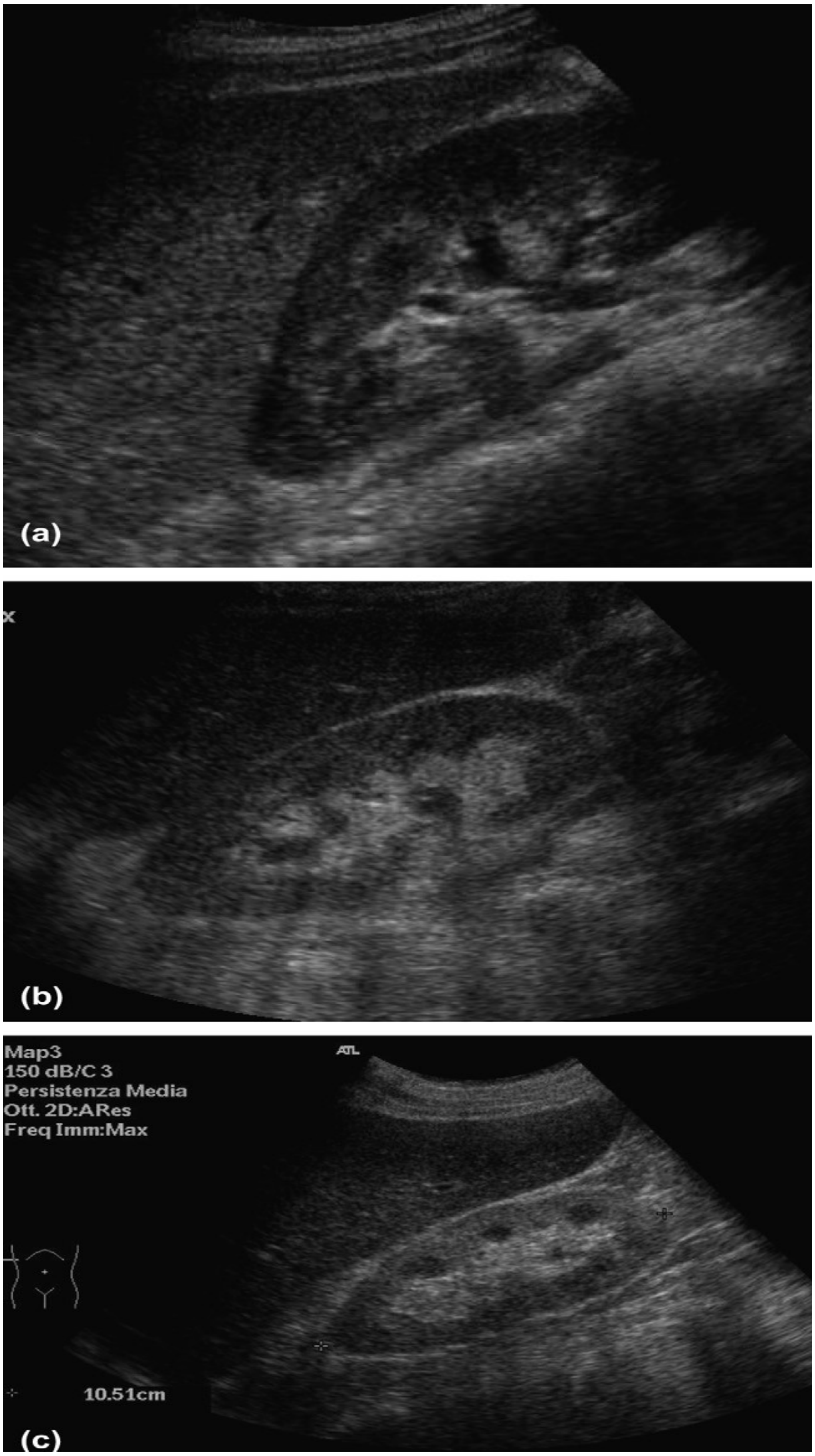

Fig (2.5): Kidney: (a) parenchyma appears hypoechoic when compared to the liver parenchyma; (b) parenchyma appears isoechoic when compare to the liver parenchyma; (c) parenchyma appears hyperechoic when compared to the liver parenchyma.

2.2 Previous study:

Somia Mohamed salih(2010):Studied the characterization of diabetic kidney and her result showed that the mean volume of Rt kidney was 131.4 $cm^{3,}$ Lt kidney 140.6 $cm^{3,}$ and the mean of C/M ratio was (0.76) for Rt kidney and (0.72) for the Lt one, there was decrease in the renal volume related to duration of diabetes. There was no difference in echogenicity.

Also Saud butt was published in 2010apaperand found in the early stages of diabetic nephropathy kidney size may be enlarged from hyper filtration with progressive kidney disease from diabetes the kidneys diminish in size from glomerulosclosclerosis. In addition arenal ultrasound can assess for hyperechogenesity that suggest chronic renal disease.

Another study done by H-J bangstad etal show the early glomerulopathy is present in younge type 1 (insulin dependent) diabetic patient with microalbuminuria where found that morphological parameters are significantly increase in diabetic group compared to control group .

At last D.soldo etal studied the diabetic nephropathy comparison of conventional and duplex Doppler ultrasonographic findings the result in asymptomatic diabetic nephropathy, renal length and parenchymal thickness where significantly increase compared to that of controls, only in advanced renal disease were both values significantly decrease . Cortical hyperechogenecity was noted only in very advanced disease.

CHAPTER THREE

Material & Method

Chapter three: Material and Method

3.1 Material:

3.1.1 machine used:

Philips IU 22with 3.5 MHZ transducer

3.1.2 Study population

Study has been done in the department of ultrasound at soba university hospital to a thirty seven subject who were admitted as patients in U/S department have D.M. All the patients with age above 30 years and had a longstanding diabetes disease.

3.1.3 Study duration:

From march (2016) to august (2016)

3.1.4 Exclusion criteria:

Diabetic patients with congenital anomaly of the urinary system or urinary tract obstruction due to stone or mass, which can affect the volume, shape of the kidney or the other study variables.

3.2 Methods

3.2.1 Study design:

This an observational analytical cross sectional study

3.2.2 Technique used

Measurement of kidneys was performed by obtaining sagittal planes for measuring the (length) and transverse planes for (width and thickness or depth), from anterior approach using liver and spleen as acoustic windows. And measurement the kidney volume, C/M ratio and cortical echogenicity were obtained.

3.2.3 Image interpretation

Evaluation of C/M ratio was done by making the ratio between the cortex and medulla measurement, and evaluation of echogenicity of the RT kidney by comparing with the liver echogenicity, while LT kidney by comparing it with spleen.

3.2.4 Data collection:

. Subject age, gender, duration of diabetes was recorded in clinical data sheet. Measurement of kidneys was performed by obtaining sagittal planes for measuring the (length) and transverse planes for (width and thickness or depth),Evaluation of the volume by measuring the three dimensions, length, width and depth(AP diameter) in long and short axes then calculated by formula :

$$V = L \times W \times AP \times 0.49$$

Evaluation of C/M ratio was done by making the ratio between the cortex and medulla measurement, and evaluation of echogenicity of the RT kidney by comparing with the liver echogenicity, while LT kidney by comparing it with spleen. Measurement has done by expert tow radiologist.

3.2.5 Data analysis:

Was caried out by Statically Package for Social (SPSS).

3.3 Ethical consideration:

The patients had to be aware of the nature of the study and had to willingly, provide informed consent before entering the study because we need more time for evaluating and measuring kidneys properly.

CHAPTER FOUR

Results

Chapter four: Results

Table (4.1) Represent: Distribution of patients by age.

Age group	Frequency	Percent
Less than 41 years	5	13.5%
41-50 years	9	24.32%
51-60 years	12	32.43%
61-70 years	6	16.21%
Greater than 70 years	5	13.5%
Total	37	100%

(A)

B))

Fig (4.1): Sample distribution for patients by age, (A) using pie graph (B) using bar graph

Table (4.2) Represent: Sample distribution for patients by gender.

gender	Frequency	Percent
Male	21	56.75%
Female	16	43.25%
Total	37	100%

(A)

Figure (4.2): Distribution of patients by gender,, (A) using pie graph (B) using bar graph

Table (4.3) Represent: Sample distribution for patients by Duration of the disease.

Duration	Frequency	Percent
Less than10 years	6	16%
10-20 years	20	54%
More than 20	11	30%
total	37	100%

A))

B))

Figure (4.3): Distribution of patients by Date of onset disease,, (A) using pie graph (B) using bar graph

Table (4.4) Represent: Sample distribution for patients by associated another disease.

Associated disease	Frequency	Percent
Yes	12	32.43%
No	25	67.57%
Total	37	100%

A))

B))

Figure (4.4): Distribution of patients by associated disease,, (A) using pie graph (B) using bar graph

Table (4.5) Represent: Sample distribution for patients by the type of diabetes.

Type of diabetes	Frequency	Percent
Insulin dependent	13	35.14%
Non-insulin dependent	24	64.86%
Total	37	100%

A))

B))

Fig (4.5)show: Distribution of patients by the type of diabetes,, (A) using pie graph (B) using bar graph

Table (4.6) Represent: the echogenicity of both kidneys.

Kidney	Frequency	Normal	Hypoechoic	hyperechoic	Total
Right	Frequency	30	2	5	37
	Percent	81%	6%	13%	100%
Left	Frequency	31	2	4	37
	Percent	83%	6%	11%	100%

Fig (4.6): Shows the echogenicity of both kidneys.

Table (4.7): Represent the mean values of different variables.

Variable		Mean cm
right kidney	Length	10.6
	Width	4.5
	Thickness	4.9
	Cortex for C/M ratio	0..68
	Medulla for C/M ratio	0.97
left kidney	Length	10.7
	Width	4.7
	Thickness	5
	Cortex for C/M ratio	0.69
	Medulla for C/M ratio	1.04

Fig(4.7) show; The mean values of different variables

Table (4.8) Represent: Mean values of volume and C\M ratio for Rt and Lt kidneys.

	Volume		C\M ratio	
	right kidney	left kidney	right kidney	left kidney
Total	116.2	125.2	0.74	0.72

Fig (4.8):shows Mean values of volume.

Fig (4.9): Mean values of C/M ratio.

CHAPTER FIVE

Discussion, conclusion and recommendation

CHAPTER FIVE

Discussion, conclusion and recommendation

5.1Discussion

This study has been done in the ultrasound department of soba hospital, for 37 subjects their age ≥ 30 years.

Most of patients suffering from diabetic represent 32.43% (12), their age range (51 – 60) years,24.3% (9) their age in(40-50) years, and 16.2% (6) from diabetes patient their age (60- 70) years while two groups of patients represents 13.5% (7) their age in (less than 41)(above 70) years respectively,, as shown in table (4.1) and fig (4.1).

The patients suffered from diabetes are classified according to the gender into male 56.75% (21) and female 43.25% (16) table (4.2) and fig (4.2).

Most of the patients 54% (20) have a longstanding diabetes for more than 10 years, and 30% (11) have a disease for more than 20 years and16 %(6) have the disease less than 10 years . Table (4.3) and fig (4.4).

32.43% (12) of diabetic patients have associated other diseases, while 67.57% (25) of them haven't associated diseases table (4.4) and fig (4.5).

Most of diabetes patients 64.86% (24) have type II of diabetic(Non insulin dependent) while 35.14% (13) of diabetes patients have type I(Insulin dependent) table (4.5) and fig (4.6).

According to the echogenicity of both kidneys most of the subjects have a normal echogenicity 81%,83% for right and left kidneys, and 6% of both kidneys have hypo echoic echogenicity, and 13% of the rt kidney and 11% of the lt kidney have hyper echoic echogenicity.

The values of result of This study showed that the values of the mean volume and C/M ratio of right kidney was 116.2cm^{3}and its C/M ratio was 0.74, and for left kidney the volume was 125.2cm^3 and C/M ratio was 0.72, which disagree with study done by Somia M.Salihwhich result that shows right kidney volume and left one were (131.4cm^3,140.6cm^3) and C/M ratio were (0.76, .72,) for right and lt kidney because there were decrease in renal volume. But was agree with study done by somia M.Salih in lt renal CM ratio (.72) and both kidneys echogenicity because there is minimal difference in echogenicity in test group.

I'm also agree with suad butt who found there is decrease in renal volume in late stage of disease and disagree with him in the renal echogenicity which I found minimal change while his result showed hyper echogenecity in most cases.

My study also agree with the study done by d. soldo etal which found significant decrease in renal length and parechymal thickness in advance diabetic renal disease

5.2Conclusion

This study has been done in U/S department at soba university hospital for 37patients who diagnoses as diabetics for more than 5 years their age ranging in30– 75 years.

The goal of study was characterized the kidney in patient with diabetes mellitus by ultrasound regarding to kidney volume, echogenicity and C/M ratio.

The results conclude that there was decrease in kidney size and increase in C/M ratio which disagree with previous study but there is minimal difference in echogenicity noted, that agree with it.

U/S scanning can characterize kidney to detect any diabetes nephropathy changes to avoid the complication.

5.3 Recommendation

Regarding to results that related to study and previous study, there are some ideas which could help researches which can be done in follow:

- U/S could be used as routine checkup, follow up to help treatment and control of the diabetic nephropathy.
- U/S is very important to diabetic patient to detect the complications as renal failure that could be avoided.
- Encourage and support the research about diabetes and its complication and how to avoid it.

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Appendix

Data collection sheet

Sudan university of science and technology

Characterization of long Standing Diabetic Kidneys by Ultrasound

Date: / / NO:

Name: age: sex: male ( ) female ( )

Date of onset disease:

( ) 5-10 ( )

≥ 10 years

Associated another disease: Yes( ) No( ) IF YES: ………………………………………………

Type of diabetes: a-insulin dependent ( ) b- Non-insulin dependent ( )

Ultrasound finding:

Right kidney:

A-volume

Length: Width: Thickness:

B- C/M ratio:

Thickness: Cortex: Medulla:

C- Echogencity:

1- Normal ( ) 2- Hypoechoic ( ) 3- Hyperechoic( )

Lift kidney:

A- Volume

Length: Width: Thickness:

B- C/M ratio :

Thickness: Cortex: Medulla:

C - Echogencity :

1- Normal ( ) 2- hypoechoic ( ) 3- hyperechoic ( )

NOTE………………………………………………………………………………………

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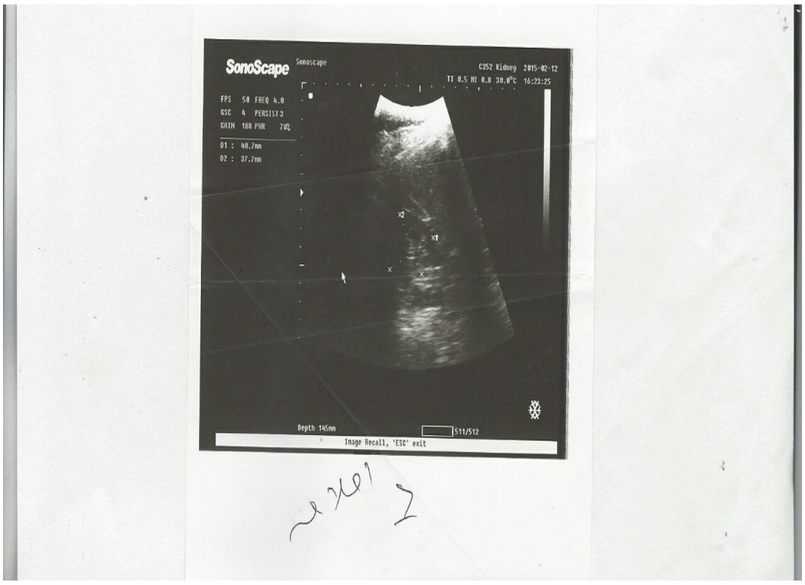
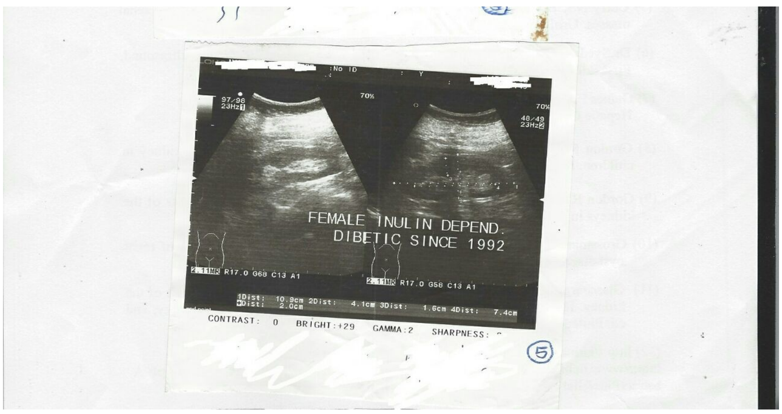
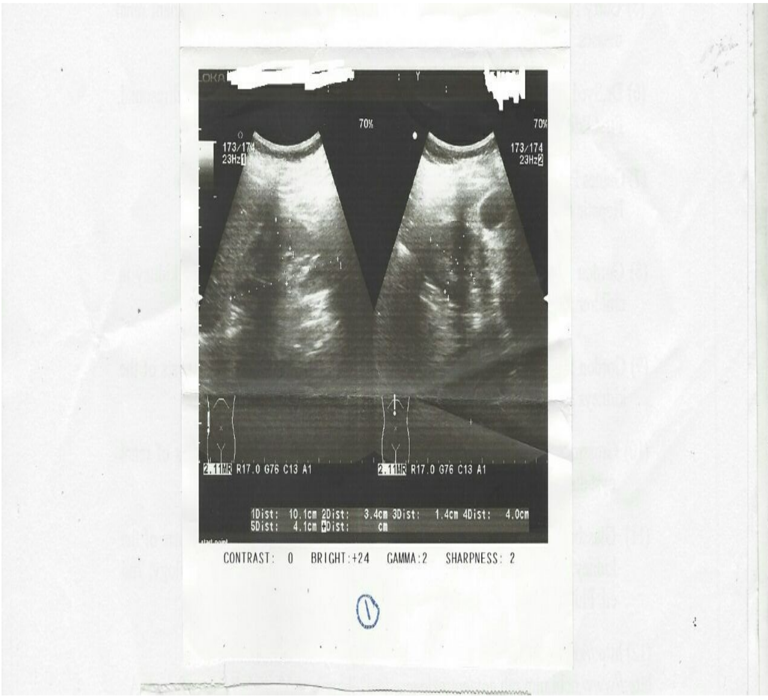


40 years old female diabetic for 7 years image show decrease in kidney size.

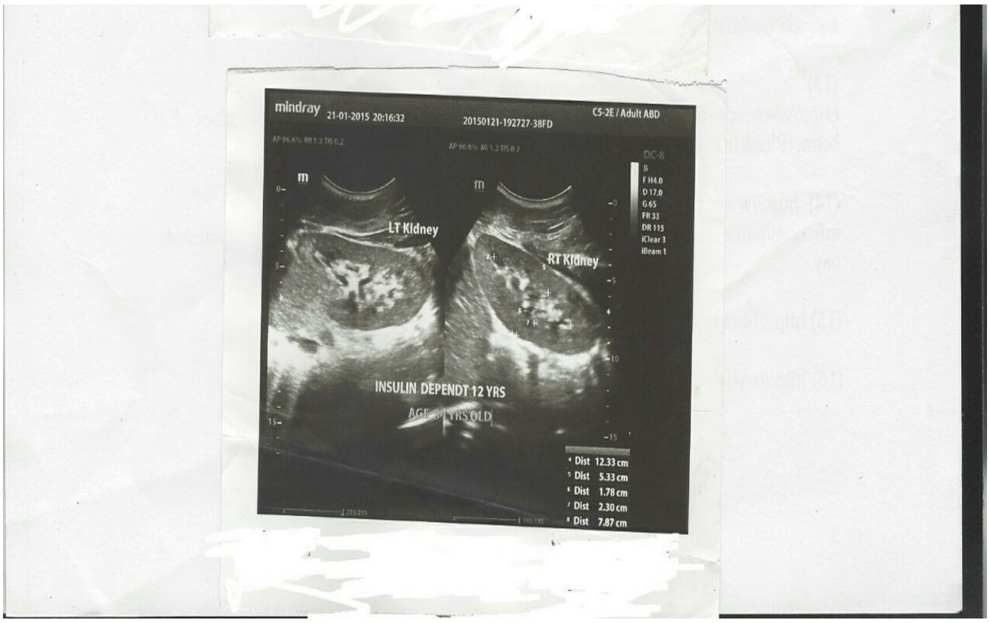


60 years old female diabetic for24 years show increase in c/m ratio

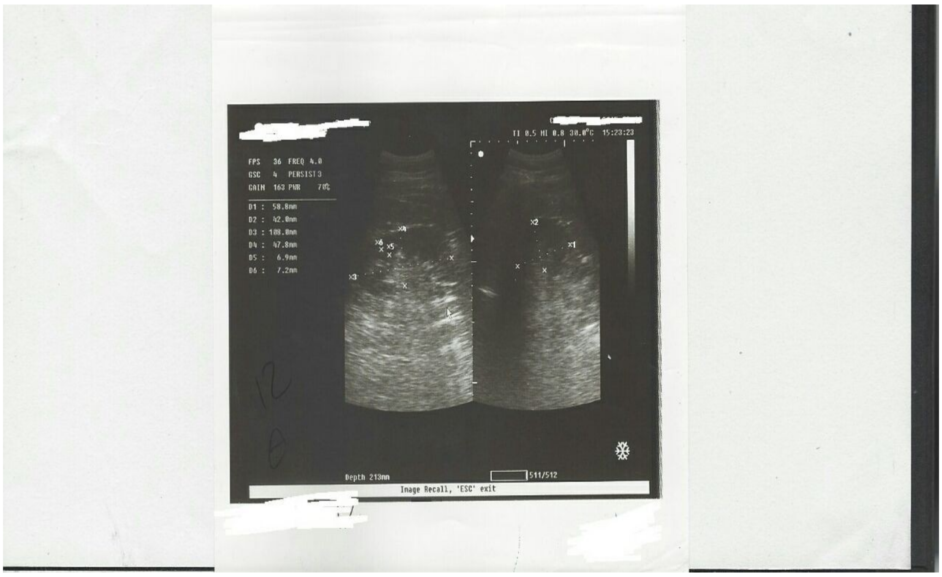
55 years male diabetic for5 years image show no change in kidney size.



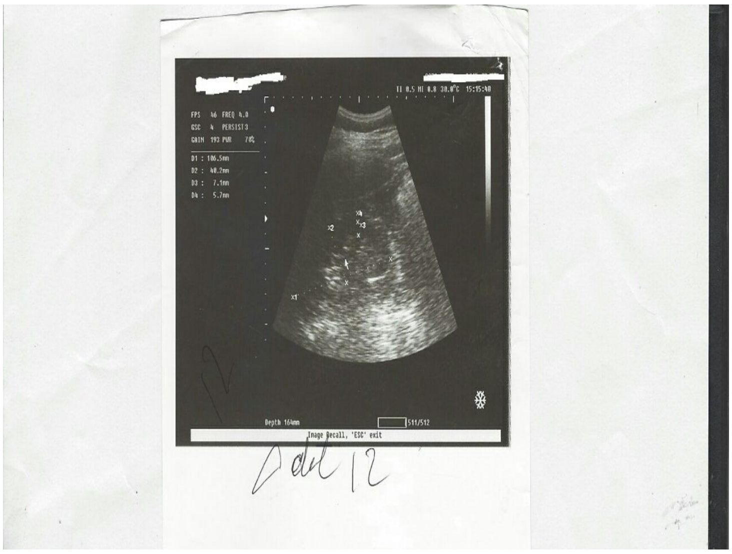
60 years old female diabetic 9 years image show increase in echogenicity.



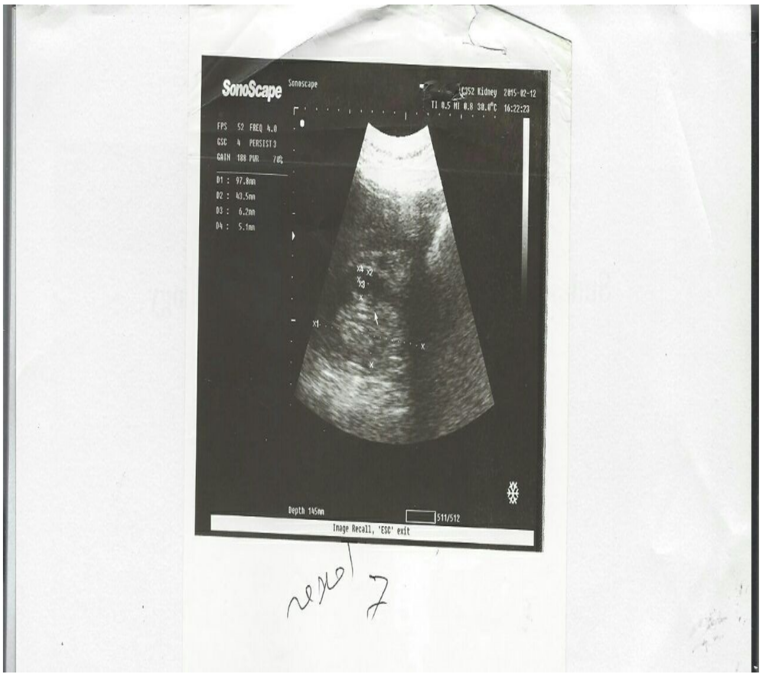
25 yearsold diabetic for 12 years image show increase in echogenecity



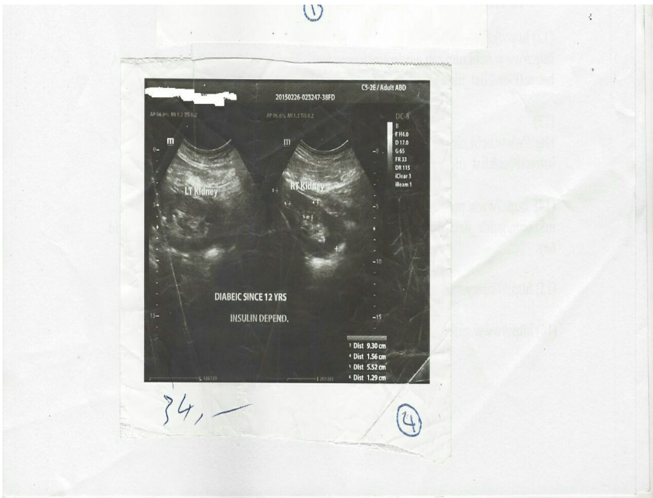
70 years male diabetic for 10 years image show decrease in kidney size.



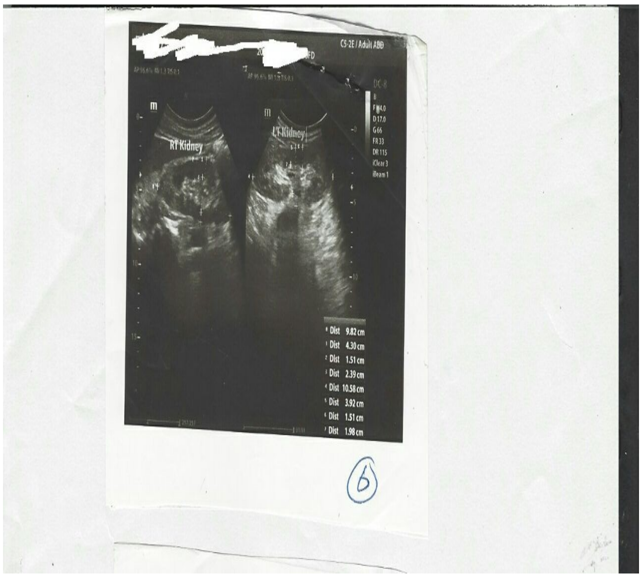
66 old male diabetic for 8 years image show loss of c/m/d.



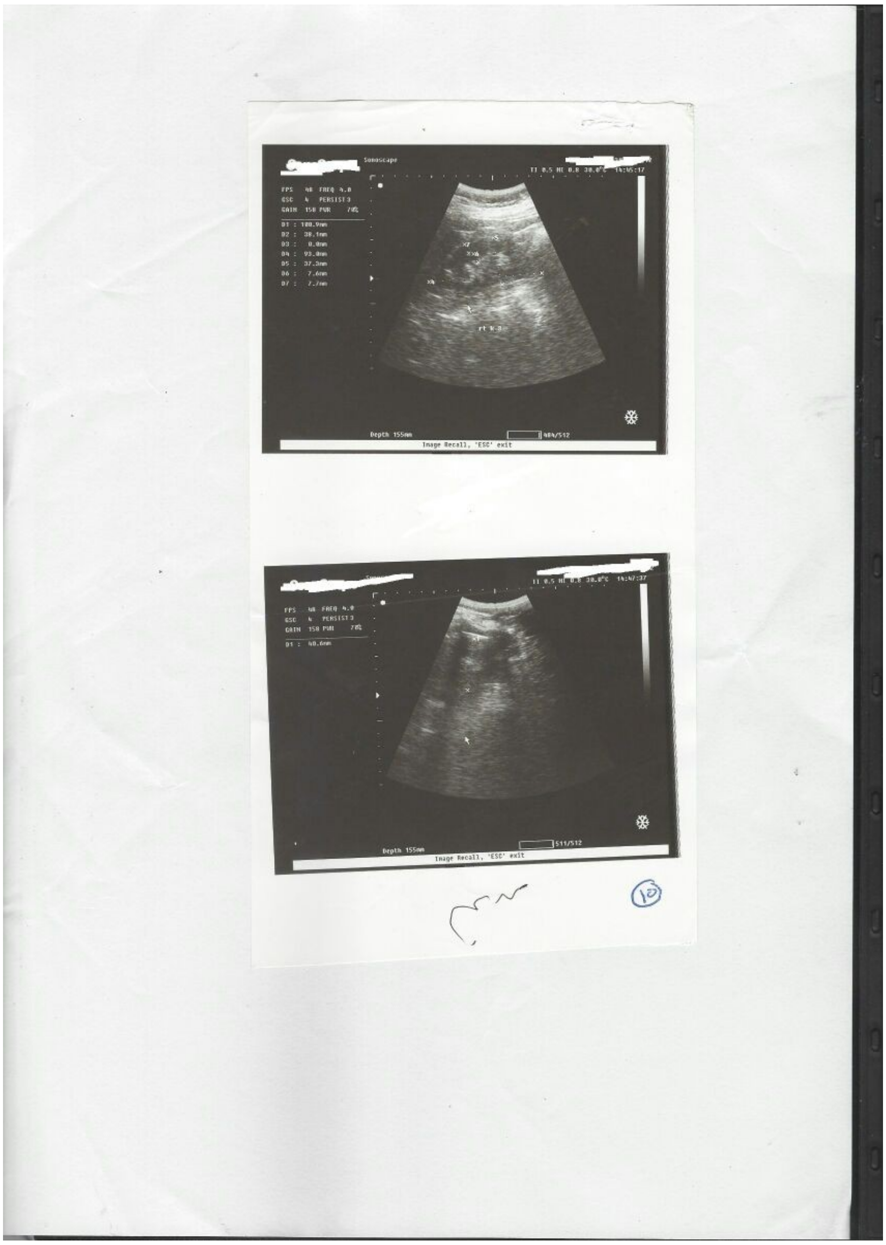
75 old female diabetic for 15 years



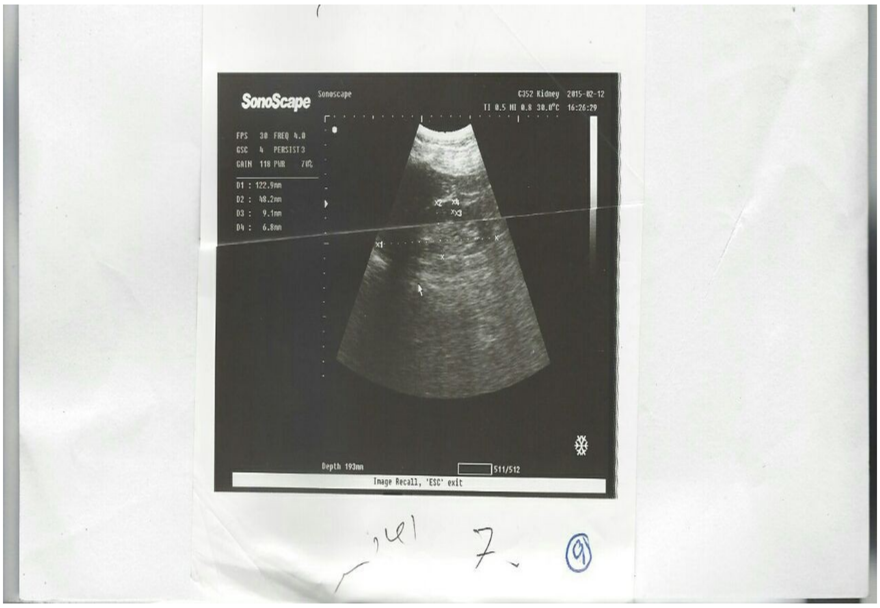
44 female diabetic for 12 years image show decrease in echogenecity



8 0 years old male diabetic for 20 years image show decrease in kidney size.



56 years male diabetic for 6 years image show decrease in c/m ratio



50 years female diabetic for 8 years with associated disease image show decrease in cortical thickness.