The Value of Urinary Albumin to Urinary Specific gravity ratio in detecting Microalbuminuria in Diabetic patients.

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أهمية نسبة الألبومين إلى الكثافة النوعية للبول كطريقة لتحديد وإيجاد اقل الزلال في المعية للبول عند مرضى داء السكر

قليل الزلال في البول عند مرضى داء السكر هو مقدمة لحصول مضاعفات داء السكر، وحساب وتحديد حصول ذلك اهمية خاصة. اعتمدت طريقة مقارنة نسبة الالبومين في البول الى الكثافة النوعية كطريقة سهله مع نسبة الالبومين في البول الى حساب ماده الكرياتينين في البول لأربعين (٤٠) مريضاً مصابين بداء السكر في عيادة داء السكر في المستشفى التعليمي في النجف من شهر اذار لعام ٢٠٠٩ الى شهر اب لعام ٢٠٠٩ وتبين خلال الدراسة الى توافق وعلاقة جيدة بين الاثنين مما يساعد على اعتماد طريقة الالبومين الى الكثافة النوعية كعملية سهله في تحديد حصول قليل الزلال في البول عند مرضى داء السكر.

Abbreviations ACE=Angiotensin converting Enzyme ACR=Albumin Creatinine Ratio AOR= Albumin/Osmolality Ratio Sp.gr=Specific Gravity D.M=Diabetes Mellitus IBW=Ideal Body Weight. SIADH=Syndrome of Inappropriate Anti-diuretic Hormone ESRD=End Stage Renal Disease eGFR= estimated glomerular filtration rate Key Words: specific gravity, Albuminuria, Diabetes.

Abstract

Background and objective

microalbuminuria is known to be harbinger of serious complications in diabetes mellitus. since medical intervention early in onset of microalbuminuria can de critical in reducing these adverse outcomes. it is widely agreed that diabetic patients should be screened for microalbuminuria. the study aim is to evaluate micral tests strips in conjunction with a urine specific gravity determination as a rapid and accurate method in detecting microalbuminuria in diabetic patients.

Patients and methods

40 diabetic patients from diabetic center of Al Sader Hospital in Najaf city were included in this study From March 2009 to August 2009. All with disease duration ≥ 5 years. Urinary albumin concentration/24 hours, urinary creatinine concentration/ 24 hours was done and the ratio of them was compared to ratio of urinary albumin Concentration done by Micral tests/ urinary specific gravity.

Results

the relation between the acr which sensitive and specific in detecting microalbuminuria and the simple method that correlates the urinary albumin to urinary specific gravity is strong association.

Introduction

proteinuria may be benign or pathological. benign proteinuria causes include: postural, excessive exercise, high or low temperature and that due to pregnancy. While the pathological one can be caused by renal etiology like pyelonephritis or extra renal cause like liver cirrhosis, plasmacytoma and congestive heart failure1. microalbuminuria refers to 24 hours albumin excretion of 30-300 mg/day or explained by urine acr lower than 30 mg/mmol 2.

diabetes mellitus is one of the most common diseases. one of the most chronic complications of dm is diabetic nephropathy which can lead to end stage renal disease (esrd). early detection of nephropathy is important as intense glycemic control prevents progression to renal failure 2. urine specific gravity is a laboratory test that measures the concentration of all chemical particles in the urine sample. the test requires clear-catch samples.substances that increase the specific gravity includes dextrose and sucrose, and intravenous contrast dye. it is also increased in addison disease, glucosuria, congestive heart failure, renal artery stenosis, shock, and siadh secretion1, 3. on other hand urinary specific gravity decreases in hyperaldosteronism , excessive fluid intake ,diabetes inspedius whether central or nephrogenic, renal failure and renal tubular acidosis3.urine dipstick chemical analysis used for longtime to detect specific gravity found to be directly proportional to urine osmolality 6. the osmolality which is a measure of the density or the ability of the kidneys to concentrate or dilute the urine over that of the plasma.

specific gravity between 1002 to 1010 on sample should consider normal with normal kidney function since the specific gravity of the glomerular filtrate in the bowman capsule range from 1007 to 1010. more the 1035, if not contaminated it indicates that the urine contains substances like glucose, dextran or intravenous contrast dyes3. osmolality refers to the concentration of a sample and is affected by all dissolved particles in a standard volume 4. measurement of osmolality requires a sophisticated instrument, a trained laboratory technician and it is time consuming. creatinine is a metabolic product of skeletal muscle creatine and phosphocreatinine metabolism. the estimation of creatinine based on the principle, that at alkaline ph values, cretinine reacts with picric acid to produce a colored compound, creatinine alkaline picrate, which can be photometrically measured.

dividing albumin by creatinine found to reduce number of false negative protein and albumin results. on other hand, the use of urinary albumin to osmolality ratio found to be better in predicting 24 hours urine albumin excretion. it showed 82% sensitivity and 86% specificity and by using cutoff value of 18.4 mg/kg/ mosm, found to be not affected by glucosuria 6. the relation between albumin/osmolality ratio (aor) on single voided samples and albumin excretion ratio (aer) on 24 hours urine sample was similar to that between albumin/ creatinine ratio acr and aer using a cutoff value 7.

it was found that aor is not appreciably affected by glucosuria so that aor can be used as an alternative test to acr in assessment of microalbuminuria in population of dm

6.because of close association between the urinary osmolality and the urinary specific gravity we tried to show the value of specific gravity in detecting microalbuminuria in diabetic patients.

Patients and methods

40 diabetic patients from The Diabetic Center in Al Sader Teaching Hospital were studied with disease duration ≥ 5 years. All patients had no significant urine leukocytes, \leq 5 cells/ cc urine, diastolic blood pressure \leq 90 mm hg.

All patients had no clinical evidence of cardiac or renal failure their weight and heights were estimated.24 hours urine albumin with serum creatinine was done for each patient. The specific gravity of the urine and urine albumin were estimated by dipstick method and readings ≥ 3 were excluded. Estimation of urine creatinine was done after studying creatinine clearance through Cockcroft and Gault equation.

Creatine Clearance = $\frac{(140 - age)x1BW}{(S.creatinine)x72(0.85 forfemale)}$

Male IBW=50kg + 2.3 for each inch over 5ft. Female IBW = 45.5kg + 2.3 for each inch over 5ft.

Then the urine creatinine was estimated from the equation.

Creatine Clearance = $\frac{Urin.creatinine.mg \setminus dlx24hr.urine.volume}{dlx24hr.urine.volume}$

s.creatinine.mg $\ dlx24hr.urine.volume$

Creatinine (Umol\L) = Creatinine (mg \dl)x 88

The urine albumin over urine creatinine ratio >2.5 mg/mmol (men) or >3.5 mg/creatinine ratio >30mg/ mmol (women). Then we correlated this albumin/creatinine ratio to albumin/specific gravity ratio by cross sectional study and making correlation coefficient and estimation of the association level of both ratio (A/C, A/sp gr.)

Results

40 diabetic patient distributes as (14) females and (26) males. The age range (35-59) years. Specific gravity ranges were [1015-1028].Serum creatinine ranges were [0.7mg\dl-1.2mg\dl]. 24 hour urine protein range from [60-180mg]. Correlation coefficient 0.74.

The following table shows these data

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24 hr. urine creatinine 24 hr. urine albumin ACR Strip albumin Sp.gr Albumine/sp.gr 8.2 8.2 8.2 5.2 10.5 6.6 2.1 6.2 12.5 7.5 12.2 7.3 9.1 5.7 6.1 12.3 9.5 11.3 12.5 7.9 12.2 8.1 11.9 7.5 11.1 10.6 7.8 8.1 12.5 5.9 8.5 6.2 7.1 9.5 5.1 10.5 6.6 5.1 6.6 8.8 8.8 6.2 11.5 7.7 7.7 12.1 6.9 12.5 7.7 6.6 11.5 8.3 6.2 6.6

Table 1 : The data of the study



Figure 1: Shows a single urine test albumin /creatinine ratio and the albumin / specific gravity ratio for each patient. The comparison shows a good correlation between urinary creatinine and urinary specific gravity



Figure 2: shows the relationship between Albumin /sp.gr and 24 hr. urine creatinine



Figure 3: shows the relationship between sp.gr and ACR



Figure 4: shows the relationship between albumin/sp.gr and sp.gr

Discussion

when one evaluates kidney function in diabetic patients, the two key markers in renal disease are urine albumin and estimated glomerular filtration rate.national kidney disease education program (nkdep) recommended that health care professional should: 1.assess urine albumin yearly to diagnose and monitor kidney disease damage and more frequent monitoring may be indicated in patients with changing clinical status or after therapeutic intervention.

2.screening of diabetic patients, using spot urine albumin/ creatinine ratio and 24 hours urine albumin excretion 10.

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unfortunately in this study it was difficult in the laboratory to do a spot urine creatinine. urinary excretion of albumin seems to be influenced by glycoxidation, whereas excretion of low molecular weight protein is rather independent of glycosulation.5

the relationship between urine osmolality and specific gravity was studied with six substances (sodium chloride, urea, creatinine, glucose, contrast dye and albumin), found to be a linear correlation and in general helps in many clinical situation such as diabetes mellitus, nephritic syndrome, after administration of contrast substance or saline diuresis. in other studies, it was clear that there is a significant correlation between urine osmolality and creatinine concentration 9.

in this study we tried to correlate the urine specific gravity as it has a linear relation with urine osmolality and to compare the albumin/ creatinine ratio to the albumin/ specific gravity ratio which a simple method to detect microalbuminuria. in this study it was found to be a significant.

this result shows the same as a new tests that compare the single urine tests that compare albumin/ creatinine ratio with albumin/ specific gravity ratio and it shows a good correlation between urinary creatinine and urinary specific gravity.

what is the level of microalbuminuria to be a signal for early threat and to point out the serious impact on the kidney still to be known. this is now being an interest especially in diabetes mellitus and in hypertension.

Conclusion and Recommendations

Urine specific gravity can be used as a single and rapid way to define the microalbuminuria.

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