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A Study on RFT Markers

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Abstract
For assessing the proper functions of the kidneys, we need to assess the renal function markers. There are various types of renal markers like radioactive and also which are non - radioactive. The different renal markers are used to assess the GFR.The aim of this dissertation is to study various markers and also analyze the present and newly developed renal function markers that help for diagnosing various clinical abnormalities of this origin.[1]

Introduction

Markers of tubular function

For assessing the functions of the renal system and functions of the tubules we need to assess first the physiological process of proximal renal tubules and also distal renal tubules. Assessment of functions like tubular handling of electrolytes like Na is to be measured. The assay of glucose is to be done. Other investigations include phosphates and minerals like calcium. The assay of bicarbonates including the key amino acids is important. Assay of acidification of the urine is must to be done along with assay of dilution and concentration. Many researchers have examines and assayed the renal function tests related to proximal tubules for newborn infants by the quantitative assay of parameter - urinary β 2-microglobulin Many researchers proved that there were two important parameters which were detected namely[2]

(1) Beta 2-microglobulin

(2) N-acetyl beta-D-glucosaminidase

Review of Literature

CKD is a type kidney disorder where there is a slow loss of the normal functions of the kidneys and gradually it may result in total loss of the functions in a time gap ranging from months to years. At the first step or on onset we don't find ant sign or symptom but as the disease progresses, some symptoms like edema of the legs, lethargy, vomiting, less appetite, mental trauma or dilemma and confusion.[3] The side effects and minor complications lead to various hormonal dys-functioning of kidneys.

CKD begins with no sign and symptoms. They appear after we do proper and routine investigations and diagnostic tests. We suddenly observe an increase in the level of serum creatinine and appearance of urinary albumin. With the progress of the disease the severe symptoms also appear. [2]

Hypertension is observed because of excess fluids with the release of vaso-active hormones from the kidney (renin–angiotensin system) causing complication of getting high blood pressure leading to cardiac failure. CKD patients are more prone to get atherosclerosis as compared to the normal people. The complications may lead to CVD. The cause may lie in the uremic toxins partially. [(4)]

Patients suffering from both disorders as chronic kidney disorder as well as CVD present with a very poor prognoses that worsens with time as contrast to the patients having only CVD. Investigation reveals the accumulation of urea initially that results in azotemia which finally leads to uremia. [(3)]

Material & Methods

It is an elaborated and extensive literature survey and we aim to study and compile present new markers renal function tests needed for the diagnosis of disorders.

Methods of Concentration and Dilution

Measurement of serum osmolality was done by the technique of direct osmometry. There was also an estimation of amount of the substances which were osmotically active foe example electrolytes like Na. Other osmotically active substance assay was of sugar mostly glucose. BUN assay was performed. The estimation of ethanol was also performed. [(5)]

Patients suffering from last stage kidney disease fall at high overall complications and as risk factors for developing cancer. If age is taken as criterion then there are more chances of risk and complications in youngsters and with increasing age the chances are minimized. The recommendation received from medical specialty institutes say that physicians are unable to do routine cancer screening for patients having limited life expectancy because of end stage disorder as this has been already established that screening methods do not give proper results. (6)

Unexplained chronic renal disease:

Causes behind some cases may not be accurately known. After the year 2020 there is a highly progressive disorder that is not explained by diabetes and hypertension. Prevalence has increased dramatically. More than 40,000 cases every year were reported since then. Some areas suffered a high mortality rate also. It was approximately five percent more than the previous reported cases. There has been a chance of connection with heavy and moderate workers or laborers working in high temperatures.

Improvements in this area were:

Regular and enough water access

Proper rest

CKDu was earlier documented in sugar cane workers in Costa Rica in early 70s. The mortality rate in plantations workers was quite more since the first documented case.

Tubular reabsorption

Process in which there is removal of solutes along with water from tubular fluid followed by transportation in blood. The term is reabsorption as the substances which were singly absorbed one time specifically in the intestines as due to the reclaiming of these by the body post glomerular fluids which finally forms urine.

There is a active/passive extraction in the mechanism of substances from tubular fluid in the connective tissue of renal interstitium. Finally there is transport of the substances to portal circulation. The mechanisms involved are:

Starling forces

Diffusion

Active transport

Indirect Reabsorption

Reabsorption of bicarbonate needs this mechanism and it does have a transporter. There are many reactions taking place in the lumen of the tubules as well as tubular epithelium. There is active secretion of hydrogen ion through a Na/H exchanger

Mechanism in lumen:

- H^+ adds with HCO_3^- to produce carbonic acid / H_2CO_3
- Enzyme luminal carbonic anhydrase changes H_2CO_3 to form $H_2O + CO_2$
- There is free diffusion of the CO_2 inside the cell

Mechanism in epithelial cell includes:

- Enzyme cytoplasmic carbonic anhydrase changes CO_2 and H_2O to form carbonic acid
- This acid then breaks to form H^+ ions and HCO_3^- ions
- HCO_3^- comes out in the cell basolateral membrane

Hormonal influence

Various important hormones of regulation required for re-absorption:

- Aldosterone:

This increases the active process of sodium re-absorption and in result water also.

- anti-diuretic hormone that increases passive reabsorption of water

Both of them put their impacts mainly on collecting ducts. [7]

There is tubular secretion simultaneously. There are substances/drugs which are mainly formed by body as the end products of metabolic reactions which can be toxic if present or formed in excess amount. They are then secreted into the renal tubule lumen.

Tables: 1

Classic laboratory findings in AKI [8]				
Type	U_{Osm}	U_{Na}	Fe_{Na}	BUN/Cr
Prerenal	>500	<10	<1%	>20
Intrinsic	<350	>20	>2%	<10-15
Postrenal	<350	>40	>4%	>20

Observation & Result

Table -2

(CKD) staging - CKD G1-5 A1-3 glomerular filtration rate (GFR) and albumin/creatinine ratio (ACR)						
ACR						
A1		A2	A3			
Normal to mildly increased		Moderately increased	Severely increased			
<30		30–300	>300			
GFR	G1	Normal	≥ 90	1 if kidney damage present	1	2
	G2	Mildly decreased	60–89	1 if kidney damage present	1	2
	G3a	Mildly to moderately decreased	45–59	1	2	3
	G3b	Moderately to severely decreased	30–44	2	3	3
	G4	Severely decreased	15–29	3	4+	4+
	G5	Kidney failure	<15	4+	4+	4+
Numbers 1–4 indicates risk of progression as well as frequency of monitoring (number of times a year). Kidney Disease Improving Global Outcomes - KDIGO 2012 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease [56]						

Discussion

There is no doubt that kidney replacement therapies may maintain and prolong the life of an affected individual but there is no option for quality of life. It is negatively affected. Transplantation of kidneys as treatment or therapy definitely leads to an increased survival of patients in end stage 5 CKD in comparison to other options; but because of many serious complications post operatively this can be linked with more mortality.[9] Transplantation along with hemo-dialysis leads to improved survival of life along with high quality of life, when compared with conventional week procedure dialysis.

Conclusion

It was concluded that more investigations are required in order to define the biomarkers for assessing renal function. We have studied about the key markers of glomerular functions are useful for accurate assessment of renal functions. They are key indicators for all type of therapeutic interventions.

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