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Utility of ^{99m}Tc DTPA Renogram in the evaluation of renal dysfunction associated with coronary artery disease in a hypertensive patient

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Abstract
Essential hypertension has adverse effects on both renal and heart function. There is an underlying relation between CKD (Chronic Kidney Disease) and CAD (Coronary Artery Disease).Patients with CKD has more severe CAD and prognosis of renal function is poor in patients with severe CAD. In the present study we are reporting the utility of 99mTc DTPA (diethylene triamine penta acetic acid) renogram in proving cardio renal association in a patient with AOE (angina on exertion) II, HTN (Hypertension) diagnosed with CAD by Tl-201 gated SPECT.
Key-words: *Essential hypertension, Coronary Artery Disease, Tc-99m DTPA renogram, Chronic Kidney Disease, cardio renal association.*
Key message: *Tc-99m DTPA renogram successfully could identify the CKD in hypertensive patient diagnosed with CAD.*

Introduction

The kidney could be the cause of essential hypertension which can also cause renal disease. High blood pressure is also very common in chronic kidney disease, and is moreover a well-known risk factor for a faster progression of kidney failure.[1]

Patients with CKD have more severe CAD, which may be why there is a high rate of cardiovascular events in CKD patients, that is, the so-called cardio renal association. Moreover, patients with more severe CAD had a poor prognosis for renal function itself. CAD seemed to be an independent risk factor for worsening of renal dysfunction.[2]

Tc-99m DTPA Scintigraphy is widely used technique due to its simplicity and ability to provide differential GFR values for each kidney. Here we report a case where Tc-99m DTPA renogram reveals the reduction in renal function of a hypertensive patient diagnosed with CAD.

Case History

A 54 year male patient presented with clinical history of AOE II, HTN and Ex-Smoker underwent Tl-201 Dual Phase Gated myocardial perfusion Scintigraphy (MPS), revealed irreversible perfusion defects in the R.C.A and L.C.X Territory indicative of CAD as shown in fig.1.

Tl-201 Gated SPECT demonstrated that Left ventricle ejection fractions during stress and rest scan were 22 and 32 respectively. These findings show negative hemodynamic response and reduced left ventricle ejection fraction as displayed in fig.2.

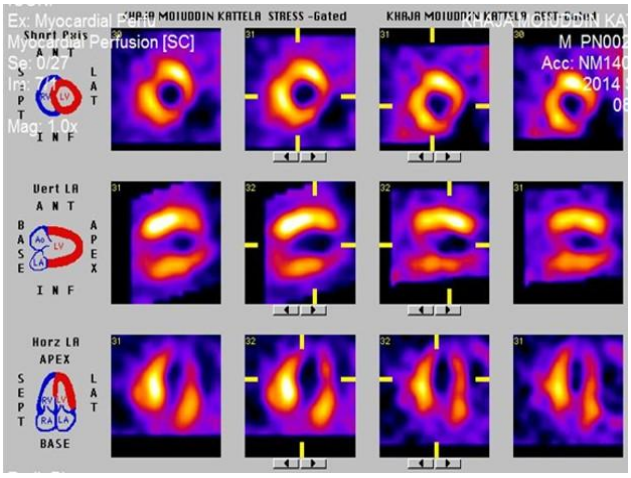
Patient had complaint about periodic back pain and no history of fever or weight loss. Blood analysis

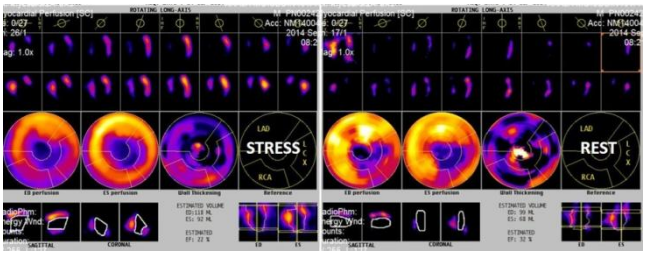
was performed and results showed an abnormal serum creatinine and urea values (1.6 and 88 mg/dl).These findings are suggestive of renal impairment in this patient. Glomerular filtration rate (GFR) is an indicator of renal function. In clinical practice, GFR is often estimated by Tc-99m-DTPA Scintigraphy. This technique is widely used due to its simplicity and ability to provide differential GFR values for each kidney.

Materials and Methods

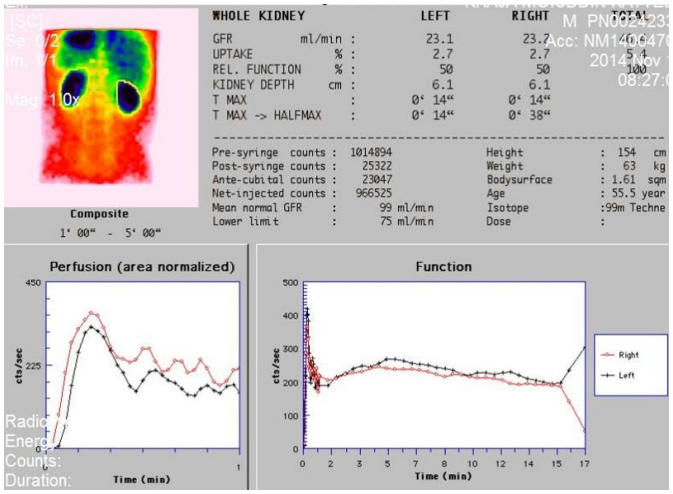
We performed Tc-99m DTPA renal scan to find out the differential renal function and also to know the renal association in CAD. Renal scan was done by injecting 5 mCi (185 MBq) of Tc-99m DTPA via intravenous route and dynamic images were acquired using standard renal scan protocol. Images were processed by ICON 2.5 software. GFR (Glomerular Filtration Rate) values and renal functional curves (Time activity curves) were generated. Tc-99m DTPA renal scan GFR values and Time Activity curves are shown in the figure.3.

Overall GFR of both the kidneys for this patient was calculated by Cockcroft gault formula using patient weight, age and serum Creatinine value. This value is compared with the GFR value obtained by renal scan. Reduced GFR was seen in the renogram 46 ml/min compare to the normal value 93 ml/min (for 50-59 aged persons [3]. This result is supported by the GFR obtained by cock's gault formula i.e. 45.74 ml/min. These findings are indicative of CKD (Chronic Kidney Disease) because GFR is <60 ml/min and association of CAD and CKD in this hypertensive patient.





Results and Discussion



High blood pressure levels are a well-recognized feature in chronic renal disease, but the ability of mild-to-moderate hypertension to produce renal insufficiency has been questioned. Nephrosclerosis, benign Nephrosclerosis, and hypertensive kidney disease are terms that clinicians use when renal damage is thought to be secondary to essential hypertension.

GFR<60 mL · min^{-1} per 1.73 m^2 is selected as the cutoff value for definition of CKD because it represents a reduction by more than half of the normal value of=125 mL·min^{-1} per 1.73 m^2 in young men and women, and this level of GFR is associated with the onset of laboratory abnormalities characteristic of kidney failure, including increased prevalence and severity of several CVD risk factors [4]. Go et al reported that among the American population patients with mild chronic kidney disease (CKD), such as those whose glomerular filtration rate (GFR) is between 45 and 59 ml·min^{-1} per 1. 73 m^{-2}, already showed substantial increases in the frequency of cardiovascular events [5]. In the present report the patient showed reduced GFR i.e.46 ml/min it is seems like CKD as mentioned above.

According to previous reports, coronary artery disease (CAD), including acute myocardial infarction (AMI), is the most frequent type of cardiovascular event in patients with CKD [6]. MPS is a very highly sensitive technique for detecting CAD in hypertensive patients, with only a modest loss of specificity compared to the general population. Our results showed that patient had irreversible perfusion defects in L.C.A and L.C.X Territory indicative of CAD.

The incidence of cardiovascular disease increases in patients with reduced renal function. Although the exact mechanisms by which impaired renal function relates to cardiovascular disease remain unclear, many possibilities have been suggested; for example, renal dysfunction activates the renin–angiotensin system and sympathetic nervous system, elevates blood pressure, and causes anemia and vascular stiffness and calcification, and so on.[7]

In the current report the patient was severely affected by the CAD with clinical history of AOE II and HTN, which in turn leads to the decreased renal function. This states the association of CAD and CKD in this patient. It is important to identify patients with CKD in an early stage because Patients with CKD may progress to end-stage renal disease. As early treatment of patients with CKD may reduce cardiovascular risk and delay the onset of end-stage renal disease. [8]

Thus we conclude Tc-99m DTPA renogram successfully could identify the CKD in hypertensive patient diagnosed with CAD.

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