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Original Article

Effect of renal transplantation on multiple hormone levels in patients of chronic kidney disease: A single center study

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ABSTRACT

Aim: To assess the level of hormones in chronic kidney disease (CKD) patients and the effect of renal transplantation (RTx) on these hormones.

Materials and methods: 17 patients enrolled and levels of 11 hormones i.e. FT3, FT4, TSH, FSH, LH, prolactin, testosterone, cortisol, growth hormone, PTH and insulin were measured in every patient before and at 1st, 3rd and 6th month after RTx with correlation to serum creatinine. Patients with underlying endocrine disorders were excluded.

Result: At 1st and 3rd month of follow up after RTx, there was no statistical significant change in the hormones level except in PTH, which normalised (Pre transplant levels: 262.542 ± 239.706 and 1 month levels: 101.412 ± 66.615 $p = 0.024$ at 3rd month level: 113.02 ± 95.960 $p = 0.036$). At 6th month, along with PTH, LH level decreased significantly (LH level pre-RTx 8.387 ± 4.536 and 3.091 ± 2.139 at 6th month $p = 0.024$). Levels of other hormones also normalised. Mean serum creatinine at 6th month had increased from its nadir level post RTx (1.149 ± 0.164 mg/dl to 1.386 ± 0.323 mg/dl $p = 0.034$), due to rise of serum creatinine in 4 patients. FT3, cortisol, prolactin and insulin levels also increased in parallel with serum creatinine, however insulin level correlated significantly ($r = 0.759$ with 95% CI = 0.015–0.962).

Conclusion: RTx corrects most of the hormonal disturbances in CKD patients, particularly abnormalities in PTH and LH levels in early post transplant period. Even mild allograft dysfunction significantly affects the hormonal levels in a manner which is similar to the changes seen in CKD.

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1. Introduction

Burden of CKD is constantly rising globally. The impact of CKD on traditional risk factors like increased coronary artery disease risk, disturbance in mineral metabolism, haematological complications etc. have been studied extensively and there are well established guidelines in management of these patients.[1,2] The impact of endocrine disturbances may be contributing significantly to the cumulative morbidity and mortality in CKD patients. However, the impact of CKD on endocrine disturbances has not received its due importance. Apart from perturbations in PTH level, disturbances in level of other hormones have not been studied adequately and we do not have any large trials or studies to corroborate this.

Kidneys play a significant part in homoeostasis of many hormones i.e. excretion of various hormones viz cortical, aldosterone, sex hormones, thyroid hormones, catecholamines and in biodegradation of peptide hormones such as PTH, calcitonin and insulin. In patients with uraemia, impairment of hormone excretion and biodegradation has been observed, as well as it affects transportation and binding of hormones with target cells as a result of receptor resistance. Renal replacement therapies (RRT), especially haemodialysis or CAPD do not significantly correct the hormonal imbalances in patients with the CKD-ESRD.[3,4]

Among RRT only RTx has been reported to reverse the majority of hormonal abnormalities in CKD patients, but some of the hormone disturbances may persist.[5] Important factors which may play a role are duration of chronic uraemia before RTx; residual function of the native kidneys; quality of functioning graft; modulation of secretion, transport, and degradation of hormones; and altered target organ responsiveness to hormones induced by immunosuppressive drugs. It is worthwhile to note that most transplantation protocols involve high dose steroids in their induction protocols that lead to significant suppression of endogenous cortisol level. Episodes of acute graft rejection are characterized by endocrine alterations similar to those seen in patients with acute or chronic renal failure.[5]

In this study we measured eleven hormones, their disturbances in CKD-ESRD patients and the effect of RTx on these hormone levels.

2. Material and methods

Patients with CKD willing for RTx, of age >18 years were included. All patients were on maintenance haemodialysis 3 times per week. Patients with underling primary endocrine disorders and on treatment for disorders of thyroid, pituitary, adrenal or diabetes mellitus were excluded. Hormones value of FT3, FT4, TSH, FSH, LH, Prolactin, Testosterone, Cortisol, PTH and Insulin, prior to and post RTx at 1st, 3rd and 6th month were measured in fasting state. Method for estimation was chemiluminiscent immunoassay system (CLIA), with Immulite 2000, Advia Centuar XP – Siemens system. Total 17 patients were enrolled and followed up for 6 month post RTx, however one patient was lost to follow up from 3rd month onwards (Fig. 1). Consent was taken from all the included patients.

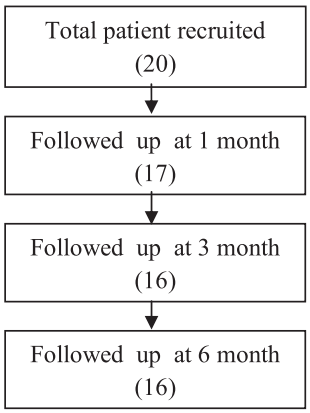

Fig. 1 – Follow up of patient post renal transplant.

Data are expressed as mean values ±SD. A paired *t* test was used to investigate the time-dependent variables. p value <0.05 was considered as significant. Percentage changes in hormone levels with time were calculated, and their associations were estimated with correlation coefficient.

3. Results

Baseline characteristics of the participants are shown in Table 1. Majority of RTx recipients were on Tacrolimus based therapy. Table 2 is showing serial measurement of hormones expressed in mean ± SD. Change in hormone levels post RTx at 1st, 3rd and 6th month were compared with pre-RTx levels. At 6th month post RTx, LH level normalized and there was significant decrease in the level of PTH.

Serial serum creatinine was measured in all the patients and till the 3rd month of follow up there was no significant change in serum creatinine from the nadir levels achieved post RTx (1.149 ± 0.164 mg/dl at 1 month and 1.156 ± 0.216 mg/dl at 3 month $p = 0.33$). But, there was rise in serum creatinine level from their nadir post RTx value in 4 patients at 6th month, this resulted in a statistically rise in mean serum creatinine level (1.386 ± 0.323 mg/dl at 6 month $p = 0.034$) (Fig. 2).

Percentage changes in the hormone levels at 1st, 3rd and 6th month post RTx were calculated. Hormones that decreased immediately after RTx at 1st month were FT3, TSH, prolactin, cortisol and PTH level i.e. 3.1%, 22.5%, 16.8%, 39.6% and 61.4% respectively. However this decrease in hormone levels was statistically significant only in PTH ($p = 0.012$). Sex hormones like FSH and LH started decreasing at 3rd month post RTx i.e. 31.1% and 49.9% respectively. However testosterone level did not show any significant change during follow up. At 6th month along with PTH, FSH and LH levels continued to decline ($p = 0.038$, 0.208, 0.048 respectively).

Levels of four hormones viz. FT3, prolactin, cortisol and insulin increased again after initial reduction, this occurred in parallel to the rise in serum creatinine at 6th month (Fig. 3). However the rise in these hormones did not correlate with the elevated serum creatinine levels, except for insulin level ($r = 0.759$ with 95% CI = 0.015–0.962).