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ORIGINAL RESEARCH

EVALUATION OF CORRELATION OF SERUM PARATHYROID HORMONE LEVELS WITH SEVERITY AND DURATION OF HEART FAILURE: AN OBSERVATIONAL STUDY

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Abstract

Background: To analyse serum parathyroid hormone (PTH) levels and its relation with severity and duration of heart failure.

Materials & methods: A total of 60 subjects were enrolled as follows: Group A: 30 Subjects with heart failure, and Group B: 30 healthy controls. Blood samples were obtained and serum PTH levels were evaluated. Classification of heart failure patients was done according to New York Heart Association (NYHA) classification. All the results were recorded and analysed by SPSS software.

Results: Mean PTH levels among the patients with NYHA Class I HF, Class II HF, Class III HF and Class IV HF was 63.8 pg/ml, 71.9 pg/ml, 91.7 pg/ml and 105.1 pg/ml respectively. Among the subjects of group A, mean PTH levels among HF patients with duration of less than 2 years and ≥2 years was found to be 69.4 pg/ml and 95.8 pg/ml respectively. While comparing the mean PTH levels among the patients of the heart failure group divided on the basis of severity and duration, significant results were obtained.

Conclusion: Their exists a significant correlation between serum PTH levels and heart failure's severity and duration thus establishing its role in the prognosis of disease.

Key words: Parathyroid, Heart failure, Severity

INTRODUCTION

The cardiovascular system consists of the heart and its blood vessels. A wide array of problems can arise within the cardiovascular system, a few of which include endocarditis, rheumatic heart disease, and conduction system abnormalities. Cardiovascular disease, also known as heart disease, refers to the following 4 entities: coronary artery disease (CAD) which is also referred to as coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease (PAD), and aortic atherosclerosis. CAD results from decreased myocardial perfusion that causes angina due to ischemia and can result in myocardial infarction (MI), and/or heart failure. It accounts for one-third to one-half of all cases of cardiovascular disease.[1- 3]

In heart failure, the heart can no longer pump enough blood around the body. The heart muscle is either too weak or not elastic enough. Different parts of the heart may be affected too. The type of medication people use for the treatment of heart failure will depend on the type of heart failure they have. Heart failure often only affects the left or right side of the heart, but can affect both.[4- 6]

Parathyroid hormone (PTH) is the major secretory product of the parathyroid glands, and in hypocalcemic conditions, can enhance renal calcium reabsorption, increase active vitamin D production to increase intestinal calcium absorption, and mobilize calcium from bone by increasing turnover, mainly but not exclusively in cortical bone. PTH has therefore found clinical use as replacement therapy in hypoparathyroidism. PTH also may have a physiologic role in augmenting bone formation, particularly in trabecular and to some extent in cortical bone.[5, 6] Hence; the present study was conducted for assessing serum parathyroid hormone levels and its relation with severity and duration of heart failure.

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MATERIALS & METHODS

The current study was conducted for analysing assessing serum parathyroid hormone levels and its relation with severity and duration of heart failure. A total of 60 subjects were enrolled as follows:
Group A: 30 Subjects with heart failure
Group B: 30 healthy controls
Complete data in relation to demographic variables was recorded. Complete clinical and medical examination of all the subjects was carried out. Exclusion criteria for the present study included subjects with history of any other systemic illness, any known drug allergy. Blood samples were obtained and serum PTH levels were evaluated. Classification of heart failure patients was done according to New York Heart Association (NYHA) classification. All the results were recorded and analysed by SPSS software. Mann-Whitney U test was used for evaluation of level of significance.

RESULTS

Among the subjects of the group A, mean age of the subjects was 58.4 years while 56.9 years was the mean age of the subjects of group B. Group A subjects had 17 males and 13 females while group B subjects had 19 males and 11 females. Mean PTH among the subjects of the Group A and group B was 81.8 pg/ml and 29.4 pg/ml respectively. Significant results were obtained while comparing the mean PTH levels among the two study groups. Mean PTH levels among the patients with NYHA Class I HF, Class II HF, Class III HF and Class IV HF was 63.8 pg/ml, 71.9 pg/ml, 91.7 pg/ml and 105.1 pg/ml respectively. Among the subjects of group A, mean PTH levels among HF patients with duration of less than 2 years and ≥2 years was found to be 69.4 pg/ml and 95.8 pg/ml respectively. While comparing the mean PTH levels among the patients of the heart failure group divided on the basis of severity and duration, significant results were obtained.

Graph 1: Comparison of PTH levels among study group and control group

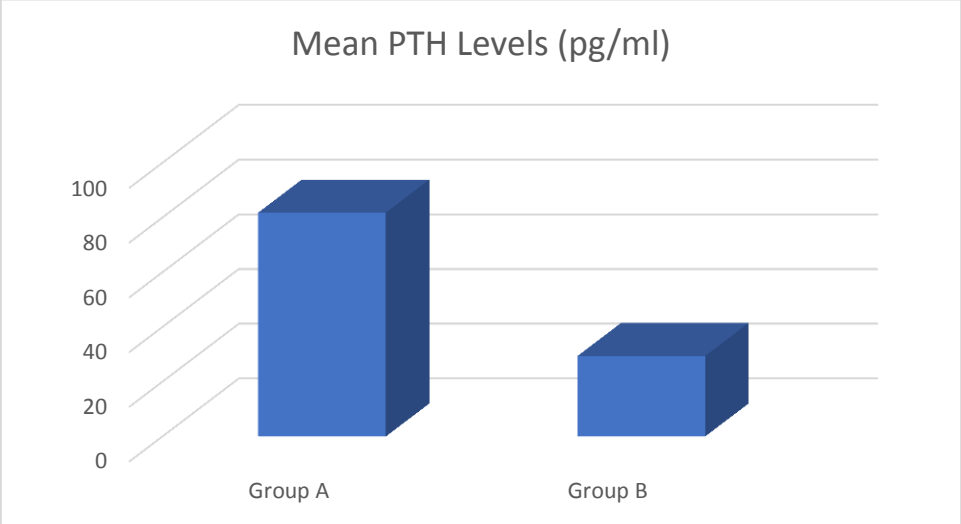

Table 1: Comparison of PTH levels among HF patients divided on the basis of duration of symptoms

Duration (years)	Mean PTH (pg/ml)	SD	p- value
Less than 2 years	69.4	12.9	
≥2 years	95.8	19.4	

DISCUSSION

Heart failure (HF) is a complex clinical syndrome characterised by the reduced ability of the heart to pump and/or fill with blood. From a physiological point of view, HF can be defined as an inadequate cardiac output to meet metabolic demands or adequate cardiac output secondary to compensatory neurohormonal activation (generally manifesting as increased left ventricular filling pressure). HF has recently been classified into three subtypes, namely HF with reduced ejection fraction (HFrEF), HF with preserved ejection fraction (HFpEF) and HF mid-range ejection fraction (HFmrEF), according to

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the ejection fraction, natriuretic peptide levels and the presence of structural heart disease and diastolic dysfunction.[6- 8]

Biomarkers play an important role for the diagnosis and prognosis of heart failure (HF), a disease with high morbidity and mortality as well as a huge impact on healthcare budgets. Parathyroid hormone (PTH) is a major systemic calcium-regulating hormone and an important regulator of bone and mineral homeostasis. PTH testing is important for differential diagnosis of calcemia related disorders and for the management of patients with chronic kidney disease. As secondary hyperparathyroidism has been evidenced in HF patients, PTH testing might be relevant in HF patients for risk stratification and more personalized selection of treatment (In recent years, SHPT has become recognized as a complication of the aldosteronism associated with congestive heart failure and where excretory Ca2+ and Mg2+ wasting results in plasma-ionized hypocalcemia and hypomagnesemia. Elevations in plasma parathyroid hormone have adverse systemic consequences, including intracellular Ca2+ overloading of myocytes and vascular smooth muscle with the induction of oxidative stress).[8- 10] Hence; the present study was conducted for assessing serum parathyroid hormone levels and its relation with severity and duration of heart failure.

Among the subjects of the group A, mean age of the subjects was 58.4 years while 56.9 years was the mean age of the subjects of group B. Group A subjects had 17 males and 13 females while group B subjects had 19 males and 11 females. Mean PTH among the subjects of the Group A and group B was 81.8 pg/ml and 29.4 pg/ml respectively. Significant results were obtained while comparing the mean PTH levels among the two study groups. Mean PTH levels among the patients with NYHA Class I HF, Class II HF, Class III HF and Class IV HF was 63.8 pg/ml, 71.9 pg/ml, 91.7 pg/ml and 105.1 pg/ml respectively. Altay H et al investigated the relation between parathyroid hormone (PTH) and heart failure with preserved ejection fraction (HF-PEF) in outpatients. One hundred consecutive patients who had preserved left ventricular (LV) ejection fraction and heart failure (HF) symptoms, were enrolled. Echocardiography, assessing the diastolic functions was performed. Blood samples were collected for intact PTH and brain natriuretic peptide (BNP). Significant correlations between PTH level and predictors of advanced HF-PEF were found ($p < 0.05$). PTH level and left atrium diameter were found to be independent predictors of DHF (Left ventricular hypertrophy and increased LVMI, both of which are essential components of HF-PEF are well known cardiovascular prognostic predictors. According to previous literature, in primary hyperparathyroidism, increased PTH and serum calcium can affect cardiomyocytes, vascular endothelial cells and vascular smooth muscle cells. PTH acts on cardiomyocytes by binding to the PTH related Peptide receptor, thereby inducing a rise in the intracellular levels of calcium). Measurement of serum PTH provides complementary information for the diagnosis and prognosis of HF-PEF.[11]

In the present study, among the subjects of group A, mean PTH levels among HF patients with duration of less than 2 years and ≥2 years was found to be 69.4 pg/ml and 95.8 pg/ml respectively. While comparing the mean PTH levels among the patients of the heart failure group divided on the basis of severity and duration, significant results were obtained. In a prospective, community-based study of 864 elderly men without HF or valvular disease at baseline (mean age 71 years, the ULSAM study) the association between plasma (P)-PTH and HF hospitalization was investigated adjusted for established HF risk factors (myocardial infarction, hypertension, diabetes, electrocardiographic left ventricular hypertrophy, smoking, and hypercholesterolaemia) and variables reflecting mineral metabolism (S-calcium, S-phosphate, P-vitamin D, S-albumin, dietary calcium and vitamin D intake, physical activity, glomerular filtration rate, and blood draw season). During follow-up (median 8 years), 75 individuals were hospitalized due to HF. In multivariable Cox-regression analyses, higher P-PTH was associated with increased HF hospitalization (hazard ratio for 1-SD increase of PTH, 1.41, 95% CI 1.12-1.77, $P = 0.003$). Parathyroid hormone also predicted hospitalization in participants without apparent ischaemic HF and in participants with normal P-PTH. In a large community-based sample of elderly men, PTH predicted HF hospitalizations, also after accounting for established risk factors and mineral metabolism variables.[12]

CONCLUSION

Their exists a significant correlation between serum PTH levels and heart failure's severity and duration thus establishing its role in the prognosis of disease.

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