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Original

Correlation of serum parathyroid hormone with pulmonary artery pressure in non-diabetic regular hemodialysis patients

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Abstract

Introduction: Pulmonary artery hypertension in end-stage renal disease is associated by significantly increased morbidity and mortality. Serum parathormone may increase among patients on hemodialysis and influence various organs.

Objectives: This study sought to find the association of serum parathormone level and pulmonary artery pressure in a group of non-diabetic patients on regular hemodialysis.

Materials and Methods: This prospective investigation was conducted in the hemodialysis section of Shahrekord University of Medical Sciences in 2013. Doppler echocardiography were used to assess pulmonary artery pressure. Pulmonary arterial hypertension is defined as systolic PAP≥35 mm Hg at rest. Serum parathormone was measured by ECL method.

Results: Sixty-five, non-diabetic hemodialysis patients were studied. Mean (±SD) of age of the patients was 56.35±20.41 years. Mean (±SD) of iPTH was 251.55±97.27 pg/ml. In this study, a significant positive association of serum iPTH with pulmonary artery pressure in patients was seen (r=0.27, p=0.029).

Conclusion: In the present study, we detected a significant positive association of serum parathyroid hormone with pulmonary artery pressure of hemodialysis patients however, our observations, warranting further investigations to evaluate the clinical aspect of the association of serum PTH with pulmonary artery pressure.

Keywords: End-stage renal disease, Hemodialysis, Pulmonary hypertension, Parathormone

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Introduction

Pulmonary hypertension in end-stage renal failure is a newly recognized disorder and is accompanied by notably increased morbidity and mortality (1-3). The prevalence of pulmonary hypertension in subjects on hemodialysis is relatively high and varies in different studies from 17% to 49.53% depending on the method of dialysis and other selection factors, such as the presence of other cardiovascular disease. Pulmonary hypertension is an independent predictor of mortality (3-6). There are various explanations including high cardiac output resulting from arteriovenous fistula (AVF), pulmonary artery calcifications, hypervolemia and anemia for pulmonary hypertension in patients with renal disease (5-8).

One of the prominent biochemical abnormalities in kidney failure is secondary hyperparathyroidism and increased parathormone. Parathyroid hormone (PTH) is found to enhance the entry of calcium into many cells, and chronic exposure to excess blood levels of parathormone is associated with increased calcium content of many tissues, hence it is, therefore, possible that the state of secondary hyperparathyroidism is one of the factors responsible for the pulmonary hypertension in hemodialysis patients (9-12).

Objectives

Therefore, this study was aimed to examine, the possible association of serum PTH level with pulmonary artery pressure in a group of non-diabetic hemodialysis patients on regular hemodialysis.

Materials and Methods

This prospective study was conducted in the hemodialysis unit of Shahrekord University of Medical Sciences.

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Implication for health policy/practice/research/ medical education

In the present study, we detected a significant positive association of serum PTH with pulmonary artery pressure of hemodialysis patients however, our observations, warranting further investigations to evaluate the clinical aspect of the association of serum PTH with pulmonary artery pressure.

The patients' data containing age, gender, medications, tobacco use, vascular access type, etiology of renal failure and duration of hemodialysis were recorded. All enrolled patients were on hemodialysis three times a week for four hours using polysulfone membranes, reverse osmosis purified water, bicarbonate-base hemodialysis solution and low-flux dialysis filters. The inclusion criterion was presence of AVF. The exclusion criteria were cigarette smoking, cardiac disease, presence of pericarditis or pericardial effusion, presence of any respiratory illness or pulmonary infection and use of calcium channel blockers medications. Furthermore, patients treated with hemodialysis below one year was not included in this investigation. Also patients with the history of collagen vascular disease, volume overload at the time of echocardiography (<50% collapsibility in IVC diameter) and positive human immunodeficiency virus (HIV) test were excluded from the study.

Pulmonary artery measuring

Echocardiography was conducted for all of the patients. Doppler echocardiography was used to evaluate left ventricular ejection fraction and to establish the pulmonary artery pressure, expiratory and inspiratory inferior vena cava (IVC) diameters, presence of pericarditis or pericardial effusion and presence of valvular disease. Pulmonary arterial hypertension is characterized as systolic PAP≥35 mm Hg at rest (4,13).

Laboratory assessments

Blood samples were obtained after a long dialysis-free weekend interval before the next hemodialysis, after a minimum 8-hour overnight fast to avoid the circadian and feeding impact on serum adiponectin fluctuations. Serum intact parathormone (iPTH) was measured by ECL method (reference range; 10.9-54.8 ρg/ml).

Ethical issues

1) The research followed the tenets of the Declaration of Helsinki and Good Clinical Practice guidelines; 2) informed consent was obtained; and 3) the research was approved by ethical committee of Shahrekord University of Medical Sciences.

Statistical analysis

Values are expressed as mean (±SD). All analysis were performed using the procedure of SAS version 9.2 (SAS Inc., Cary, NC, USA). Difference in mean serum adiponectin and pulmonary artery pressure between male and female was evaluated by paired Student's *t*-test. The strength of the association between the variables was estimated by Pearson's correlation coefficient. A p-value less than 0.05 was considered significant.

Results

Sixty-five, non-diabetic hemodialysis patients were studied. Mean (±SD) of age of the patients was 56.35±20.41 years. Mean (±SD) of iPTH was 251.55±97.27 ρg/ml (Minimum: 85; maximum: 525 ρg/ml). The length of the time hemodialysis patients on dialysis was 5.06 (±5.04) years. The value of pulmonary artery pressure was 32.32 (±20.67) mm Hg. In this study, a significant positive association of serum iPTH with pulmonary artery pressure in patients was seen (r=0.27, p=0.029; Figure 1).

Discussion

In this study, we detected a significant positive association of serum iPTH with pulmonary artery pressure of hemodialysis patients. Pulmonary arterial hypertension is not uncommon illness in patient under hemodialysis through arteriovenous access (1-8). The etiology of pulmonary hypertension is not fully understood, while various factors interacted. It is hypothesized that, arteriovenous fistula-induced increased cardiac output, and accordingly increment of pulmonary artery pressure. Other factors except AVF are anemia and hypervolemia (2-7). It is also possible that micro-bubbles escaping from the hemodialysis circuit can cause vasoconstriction and vascular sclerosis (4-8). Various investigations had detected that, pulmonary vessels show signs of dysregulation of vascular tone and endothelial dysfunction due to an imbalance in vasoactive substances, and local and systemic micro-inflammation (1-4). Previously in a study

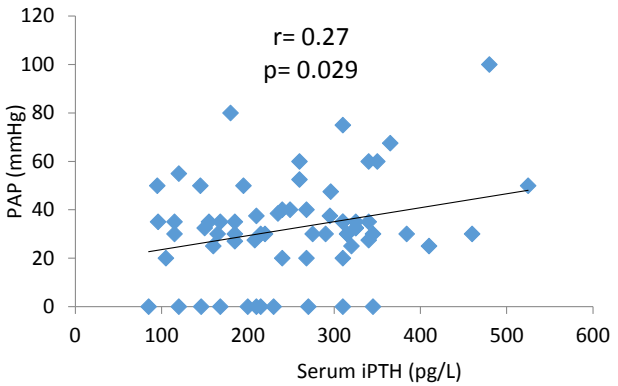

Figure 1. Significant positive association of serum iPTH with pulmonary artery pressure

on 102 regular hemodialysis patients, Nasri et al., detected a pulmonary artery pressure of 41.5 ± 12.6 mm Hg. They found, 76.5% of hemodialysis patients had pulmonary artery pressure ≥ 35 mm Hg (13). They also found that pulmonary artery pressure had significant positive association with the duration and degree of hemodialysis. Kumbar et al. tested the prevalence and characteristics of pulmonary hypertension in peritoneal dialysis patients. They observed a pulmonary hypertension of 42% in their study patients. They detected, the values of pulmonary artery pressure correlated directly with serum levels of phosphorus, Ca×P product, and also level of PTH (7). It is possible that pulmonary artery calcifications secondary to hyperparathyroidism, responsible for pulmonary hypertension in dialysis patients (3-8). Previously, Nasri *et al.*, also had shown the positive association of serum intact parathormone and pulmonary hypertension in hemodialysis patients (14), a finding which was demonstrated by others too (15) and was also conformed with the result of our study. However, it is unclear the exact role PTH in pulmonary hypertension and needs further investigation.

Conclusion

In the present study, we detected a significant positive association of serum PTH with pulmonary artery pressure of hemodialysis patients however, our observations, warranting further investigations to evaluate the clinical aspect of the association of serum PTH with pulmonary artery pressure.

Authors' contributions

SM and MH conducted the research. MH gathered the data. AB wrote the manuscript.

Conflict of interests

The authors declared no competing interests.

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