



Impact of parathyroid hormone on pulmonary artery pressure in hemodialysis patients

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Pulmonary artery hypertension has been found to be high among end-stage renal disease and dialysis patients (1). While, the prevalence of pulmonary artery hypertension in dialysis individuals is relatively high and varies in different investigations from 17% to 49.53% depending on the method of dialysis (1,2). Various investigations, have shown that, pulmonary hypertension in end-stage kidney failure patients is associated with significantly increased mortality and morbidity (1,2). Previously, in a study of 102 maintenance hemodialysis patients, we detected pulmonary artery pressure of 41.5 ± 12.6 mmHg. In our study, 76.5% of hemodialysis patients had systolic pulmonary artery pressure = 35 mmHg. In our study, we found that pulmonary artery pressure had significant positive association with the duration and degree of hemodialysis (1). Recently in a retrospective study of chronic hemodialysis and peritoneal dialysis patients, by Etemadi *et al.*, pulmonary hypertension was found in 41.1% patients of the hemodialysis patients and in 18.7% patients of the peritoneal dialysis individuals, where pulmonary hypertension was defined as a systolic pulmonary artery pressure ≥ 35 mmHg. The result of this study showed that unexplained pulmonary hypertension seems to be more common in patients undergoing hemodialysis than with individuals in the peritoneal dialysis patients (3). More recently to find the frequency and leading factors of pulmonary hypertension among maintenance hemodialysis patients, Shoukat *et al.*, studied, hemodialysis patients between 16 to 60 years of age for at least three months not having pre-existing valvular cardiac disease, chronic pulmonary disease or connective tissue disorder. Of 178 patients 76 patients had pulmonary hypertension. Out of the studied factors, low serum albumin (< 3.4 mg/dl) was found to be statistically significant in patients with pulmonary hypertension. They concluded that, pulmonary hypertension was frequently present in dialysis patients. This subset of group had significantly lower albumin levels in serum (4). The pathogenesis of pulmonary hypertension in hemodialysis patients is not well understood (2) and various metabolic and hormonal derangements, impaired endothelial function, high cardiac output due to arterio-venous fistula

■ Implication for health policy/practice/research/medical education

Pulmonary arterial hypertension is a serious cardiac complication among patients with end-stage kidney disease, especially patients on hemodialysis. To achieve better detecting the interacted factors, more clinical studies suggests.

(AVF), anemia and fluid overload has been described as the important factors. Malnutrition associating impaired pulmonary function tests in hemodialysis patients previously reported (1-4). To investigate an association between pulmonary hypertension and nutrition and inflammation of hemodialysis patients a total 179 hemodialysis patients were studied by Genctoy *et al* (5). They found pulmonary hypertension in 48 of 179 patients. They found, body mass index was negatively correlated with pulmonary artery pressure. They also detected that hemodialysis vintage, prevalence of diabetes, gender, type of vascular access were not different between patients with pulmonary hypertension and without pulmonary hypertension. Patients with pulmonary hypertension were older. This study also showed that, percent body fat, serum albumin, truncal fat, serum triglyceride and total cholesterol levels were significantly lower in patients with pulmonary hypertension than with no pulmonary hypertension (5). To find other factors influence the pulmonary artery pressure that pulmonary artery pressure, we conducted a cross-sectional investigation on patients with end-stage renal disease undergoing regular hemodialysis treatment by an arteriovenous fistula which was created on the hand, and with acetate basis dialysate and polysulfone membranes. The hemodialysis patients were under hemodialysis for two or three times per week. Exclusion criteria were past history of chronic obstructive lung disease, asthma, multiple lung infections, history of cough, allergy, cigarette smoking, previous pulmonary embolism, using drugs affects pulmonary function or structure, chest wall or parenchymal lung disease, systemic lupus erythematosus, left-to-right shunt,

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and significant mitral or aortic valve disease and also any other past history of lung disease and also any lung abnormality on the chest x-ray. According to the severity of secondary hyperparathyroidism, our patients being treated for secondary hyperparathyroidism was given oral active vitamin D3, calcium carbonate and Rena-Gel at various doses. Pulmonary hypertension was calculated as a systolic pulmonary artery pressure greater than or equal to 35 mmHg. Duration and doses of hemodialysis treatment were calculated from patients' records and the duration of each hemodialysis session was four hours. Our patients were 102 under hemodialysis due to end-stage kidney failure consisting of 73 non diabetic hemodialysis patients, and 29 diabetic hemodialysis patients (6). In this study a significant positive correlation of pulmonary artery systolic pressure with serum intact PTH in hemodialysis patients was found (6). Hyperparathyroidism is correlated with pulmonary vascular calcification and pulmonary artery hypertension in a chronic renal failure dog model, and increased prevalence of pulmonary artery hypertension and its positive association with hyperparathyroidism in pre-dialysis chronic renal disease and hemodialysis patients are reported (7). In a study by Genctoy *et al.*, one-hundred and ninety patients with CKD and no coronary artery diseases, congestive heart failure, smoking history, and pulmonary problem were enrolled. They found a pulmonary artery pressure >35 mmHg in 68 patients (35.9 %). Patients with pulmonary artery hypertension, higher parathyroid hormone levels (7). The impact of high serum PTH concentration on pulmonary artery pressure may be through an increasing calcium content of the smooth muscle cells of the artery. Previously we showed that high serum PTH is correlated with an increased incidence of systemic hypertension in stable hemodialysis individuals (8). Indeed, the parathyroid hormone is known to enhance the entry of calcium into many cells, chronic exposure to excess blood levels of PTH is associated with increased calcium content of many tissues (8).

Pulmonary arterial hypertension is a serious cardiac complication among patients with end-stage renal failure, particularly patients on dialysis. In order to achieve better understanding the role of parathyroid hormone as an aggravating factor of pulmonary hypertension, more clinical studies suggests (8-10).

Authors' contributions

All authors wrote the manuscript equally.

Ethical considerations

Ethical issues (including plagiarism, misconduct, data fabrication, falsification, double publication or submission, redundancy) have been completely observed by the authors.

Conflicts of interests

The authors declared no competing interests.

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