Rev Port Pneumol. 2012;18(1):10–14

revista portuguesa de PNEUMOLOGIA
portuguese journal of pulmonology
www.revportpneumol.org

ORIGINAL ARTICLE

Unexplained pulmonary hypertension in peritoneal dialysis and hemodialysis patients

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Received 29 January 2010; accepted 6 July 2011
Available online 14 September 2011

KEYWORDS
Unexplained pulmonary hypertension;
Peritoneal dialysis;
Hemodialysis

Abstract
Objectives: To compare the prevalence of unexplained pulmonary artery hypertension (PAH) in hemodialysis (HD) and peritoneal dialysis (PD) patients and to compare laboratory parameters between patients with unexplained PAH and those with normal pulmonary artery pressure (PAP).
Methods: We retrospectively reviewed the medical records of 278 chronic HD and 145 chronic PD patients. Laboratory findings including hemoglobin, calcium, phosphorus, alkaline phosphatase, albumin, parathyroid hormone level, serum iron, total iron binding capacity, ferritin, creatinine and blood urea nitrogen were documented. The results of transthoracic Doppler echocardiography were used to determine the pulmonary artery pressure (PAP). PAH was defined as a systolic pulmonary artery pressure (SPAP) $\geq$35 mmHg. To rule out secondary PAH, patients with cardiac disease, pulmonary disease, collagen vascular disease, volume overload at the time of echocardiography and positive human immunodeficiency virus test were excluded.
Results: Data from 34 patients in group HD and 32 individuals in group PD were analyzed. The median age of the study population was 57 (45–68) years. The median SPAP value in patients with PAH was 37.5 (35–45) mmHg. According to the echocardiographic findings, PAH was found in 14 (41.1%) patients of HD group and in 6 (18.7%) patients of PD group ($P = 0.04$). The median serum iron and hemoglobin was significantly lower in patients with PAH compared to those in patients with normal PAP ($P < 0.05$).
Conclusion: Unexplained PAH seems to be more frequent in patients undergoing HD than patients in PD group. Moreover, hemoglobin and serum iron levels are lower in patients with PAH compared to those in normal PAP group.

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0873-2159/$ – see front matter
doi:10.1016/j.rppneu.2011.07.002

PALAVRAS-CHAVE
Hipertensão arterial pulmonar inexplicável;
Diálise peritoneal;
Hemodiálise

Hipertensão pulmonar inexplicável em doentes com diálise peritoneal e hemodiálise

Resumo
Objetivos: Comparar a prevalência de hipertensão arterial pulmonar (PAH) inexplicável em doentes sob hemodiálise (HD) e diálise peritoneal (PD) e comparar os parâmetros laboratoriais entre doentes com PAH inexplicável e aqueles com pressão arterial pulmonar normal (PAP).
Métodos: Revimos, de forma retrospetiva, os registos médicos de 278 doentes com HD crónica e 145 com PD crónica. Dos dados laboratoriais foram registadas hemoglobina, cálcio, fósforo, fosfatase alcalina, albumina, nível de paratormona, ferro sérico, capacidade total de ligação de ferro, ferritina, creatinina e nitrogénio ureico no sangue. Os resultados do ecocardiograma doppler *transtorácico* foram utilizados para determinar a pressão arterial pulmonar (PAP). A PAH foi definida como uma pressão arterial pulmonar sistólica (SPAP) $\geq$35 mmHg. Para excluir a PAH secundária, foram excluídos os pacientes com problemas cardíacos, doenças pulmonares, doenças vasculares do colagénio, excesso de volume na altura do ecocardiograma e vírus de imunodeficiência humana positivo.
Resultados: Foram analisados dados de 34 pacientes no HD e 32 indivíduos no grupo PD. A mediana de idade da população estudada foi de 57 (45–68) anos. O valor médio de SPAP em doentes com PAH foi de 37,5 (35–45) mmHg. De acordo com os resultados do ecocardiograma, a PAH foi registada em 14 (41,1%) pacientes do grupo HD e em 6 (18,7%) pacientes do grupo PD ($P = 0,04$). A mediana do ferro sérico médio e da hemoglobina estavam significativamente mais baixos em pacientes com PAH em comparação com os pacientes com PAP normal ($P < 0,05$).
Conclusão: A PAH inexplicável parece ser mais frequente em pacientes com HD do que em pacientes no grupo de PD. Além disso, os níveis de hemoglobina e ferro sérico são inferiores em pacientes com PAH comparando com os do grupo de PAP normal.

Introduction

Pulmonary arterial hypertension (PAH) is a newly recognized disease in patients with renal disease.[1] In clinical practice, shunting of blood from the left to the right side of the heart and increased cardiac output and pulmonary blood flow are common medical conditions resulting in PAH.[2] However, Yigla et al. first noted unexplained PAH in some long-term hemodialysis (HD) patients during an epidemiologic study.[3] They attributed both end stage renal disease (ESRD) and long-term HD therapy via an arteriovenous (AV) access to the pathogenesis of PAH in these patients.[3,4] On the other hand, the prevalence of PAH in patients on peritoneal dialysis (PD) is still a matter of debate.[5,6] The information in the literature regarding unexplained or primary PAH in ESRD patients especially PD patients is limited. Therefore, the aim of the present study was to compare the prevalence of unexplained PAH in HD and PD patients. In addition, we aimed to compare laboratory parameters between patients with unexplained PAH and those with normal pulmonary artery pressure (PAP).

Materials and methods

We retrospectively reviewed the medical records of 278 chronic HD and 145 chronic PD patients treated at the hospitals affiliated to the university in Tabriz, Iran between May 2008 and January 2010. The patients' data including age, sex, co-morbidities, medications, tobacco use, etiology of renal failure, vascular access type, and duration of dialysis therapy were recorded. Laboratory findings including hemoglobin, calcium, phosphorus, alkaline phosphatase, albumin, parathyroid hormone (PTH) level, serum iron, total iron binding capacity, ferritin, creatinine and blood urea nitrogen were documented. The results of transthoracic Doppler echocardiography were used to determine the pulmonary artery pressure, expiratory and inspiratory inferior vena cava (IVC) diameters and percent collapse, left ventricular ejection fraction, presence of valvular diseases, etc. PAH was defined as a systolic pulmonary artery pressure (SPAP) $\geq$35 mmHg.

Patients with cardiac disease, pulmonary disease, collagen vascular disease, volume overload at the time of echocardiography (<50% collapsibility in IVC diameter) and positive human immunodeficiency virus (HIV) test were excluded. Additionally, patients treated with dialysis <3 months or >7 years were not included in the present study.

Data were presented as median (interquartile range). All statistical analyses were performed with Statistical Package of Social Science (SPSS Inc., Chicago, IL) for Windows version 16. The Mann–Whitney *U* test, chi-square test and Fisher's exact test were used wherever appropriate. A *P*-value <0.05 was considered statistically significant.

Results

Data from 66 patients were analyzed: 34 in group HD and 32 in group PD (Fig. 1). The median age of the study population was 57 (45–68) years. The median duration of dialysis was 102 (54.25–161) weeks in HD group and 44 (24.5–82) weeks in PD group ($P = 0.001$, Mann–Whitney *U* test). Among