21 - SPIROMETRIC EVALUATION PRE AND POST HEMODIALYSIS TREATMENT

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INTRODUCTION

Chronic Kidney Disease (CKD) is characterized by slow and progressive loss of kidney function (SOCIEDADE BRASILEIRA DE NEFROLOGIA, 2013), occurring steady decrease of the renal parenchyma, for at least three months.

The glomerular filtration (GF) in chronic renal failure patients reaches values lower than 60 ml/min/1.73m2 and is classified into stages 1 through 5, stage 1 being the lighter and stage 5 the most severe (PARMAR, 2002). People in stage 5 of the disease have lower values of FG at 15 mL/min/1.73m2 and symptoms of uremic neuropathy and myopathy. For these reasons usually are in some form of renal replacement therapy (NATIONAL KIDNEY FOUNDATION, 2002).

Hemodialysis is one of the three alternatives most commonly used consists in an artificial process of blood purification in order to remove toxins that accumulate in the body in cases of chronic renal failure, remove excess liquid and maintaining safe levels of electrolytes (ROCHA; MAGALHÃES; LIMA, 2010).

According to the Brazilian Society of Nephrology, Census dialysis (2013), there was a steady advance in the DRC numbers undergoing hemodialysis in Brazil. This number has increased by more than double in the period of 13 years, from 42,695 people in 2000 to 100,397 people in 2013, with the most affected age group between 19 and 64 years (SOCIEDADE BRASILEIRA DE NEFROLOGIA, 2013).

One of the most common causes of the disease is hypertension, since this affects the glomeruli and renal injure the hair, decreasing the rate FG (NATIONAL KIDNEY FOUNDATION, 2002).

The fact that many people with CKD perform hemodialysis, the consequences of this treatment have been much discussed, among them are the side effects involving the health and quality of life, affecting most systems such as cardiovascular, immune, endocrine, musculoskeletal and breathing, the latter is characterized by being the most affected (ROCHA; MAGALHÃES; LIMA, 2010, BREITSAMETER; THOMÉ; SILVEIRA, 2008).

The uremic myopathy is responsible for musculoskeletal and respiratory changes in the DRC because it causes decrease in protein-calorie intake, with muscle disuse atrophy and muscle protein imbalance, affecting mainly the muscle fibers type II, reduction of vascular and capillary bed, presence intravascular calcification and reduction of local blood flow. These changes are described for skeletal muscles, especially the deltoid, quadriceps and abdominals, but the muscles responsible for breathing act are also affected, such as the diaphragm and intercostal, causing decrease in strength properties and muscular endurance. The DRC has other conditions affecting lung function such as, pulmonary edema, pleural effusion, fibrosis, pulmonary and pleural calcification, pulmonary hypertension, decreased pulmonary capillary blood flow and hypoxemia (CURY; BRUNETTO; AYDOS, 2010).

Changes being found as airflow limitation, obstructive disorders, reduced lung diffusion capacity, decreased endurance and respiratory muscle strength (ROCHA; MAGALHÃES; LIMA, 2010).

Thus people in hemodialysis treatment have decreased fitness, interfering considerably in their way of life (ROCHA; ARAÚJO, 2010).

Due to the large impact on quality of life of people with CKD undergoing treatment of hemodialysis and evidenced respiratory changes, the objective of this study was to compare spirometry measurements before and after hemodialysis treatment.

METHODOLOGY

The study was quantitative, transversal and descriptive, involving people a foundation for treatment of CKD. The study was approved by the Research Ethics Committee of the University of Vale do Itajaí with number 703.796/14.

Participants were selected through probabilistic sampling. They signed the informed consent and informed to carry out the collection and were selected according to the inclusion and exclusion criteria. Inclusion criteria were adults of both sexes, who performed independent hemodialysis treatment time. Exclusion criteria were under 18, are in unstable medical conditions that would prevent the achievement of spirometric tests, such as: severe dyspnea (to rest), severe hypertension, Uncontrolled cardiac arrhythmias that caused any symptoms or hemodynamic compromisse, decompensated diabetes (blood glucose above 300 mg/dL), acute systemic disease or fever of unknown origin, hemoptysis of unknown cause, recent myocardial infarction (within 3 weeks), pulmonary thromboembolism, cerebral, thoracic or abdominal aneurysms, Recent eye surgery (within 3 weeks), cognitive impairment and unable to understand the guidelines for testing.

Pulmonary function was assessed by spirometry using a spirometer portable Espirobank Model International Medical Reserch. We assessed the measures of forced vital capacity (FVC), forced expiratory volume in one second (FEV1), FEV1/FVC (FEV1/FVC) and Expiratory Flow Peak (EFP) following the technical procedures and criteria acceptability recommended by Sociedade Brasileira de Pneumologia e Tisiologia (2002).

The results were expressed in liters and liters per second and percentage of the values of the spirometry. The FVC variables FEV1, FEV1/ FVC and PEF obtained by spirometry were analyzed using simple descriptive statistics from the average, maximum and minimum values, pre and post hemodialysis. The same variables were compared in pre and post hemodialysis moments through the Student t test, with significance level of 5% ($p < 0.05$).

RESULTS

The sample consisted of 55 people, with 69,09% were male and 30,90% were female. The age ranged between 23 and 85 years, averaging 55,616,07 years.

The means of variables, maximum and minimum values and p value for each evaluated variable can be seen in Table 1.

There was an increase in mean FVC and FEV1 post hemodialysis, but when analyzed separately, there was decrease

in FVC in 54,54% of those assessed with a mean decrease of 0,71 liters and FVC increase in 43,63% with mean increase 0,67 liters, and only one person remained the same after hemodialysis value. FEV1 after hemodialysis showed 56.36% increase of those with a mean decrease in 0,42 liters and 41,81% with mean 0,40 liters, only one person remained the same value. When comparing the average FVC and FEV1 before and after hemodialysis, the p value was 0,53 and 0,33 respectively with no statistically significant difference in both values.

In the evaluation of FEV1/FVC values, post hemodialysis average showed little reduction. Post hemodialysis, 50,90% people increased the FEV1/FVC ratio, with an average increase of 0,08 and 49,09% people had decreased, with an average of 0,09.

When comparing the average FEV1/FVC pre and post hemodialysis, the p value was 0,77 no statistically significant difference.

Table 1 - Average, maximum, minimum and p values spirometry test variables.

	Pre	Post	Maximum	Minimum	*p*
FVC (L)	4,47	4,56	9,1	1,64	0,53
FVC (%)	129,98	130,50	238	56	-
FEV1 (L)	2,67	2,73	6,11	1,09	0,33
FEV1 (%)	94,29	94,98	174	48	-
FEV1/ FVC	62,49	62,04	86	26,7	0,77
EFP (L/s)	4,98	4,66	12,64	0,93	0,18
EFP (%)	67,69	62,94	175	20	-

-FEV1/ FVC62,4962,048626,70,77EFP (L/s)4,98 4,66 12,64 0,93 0,18EFP (%)67,69 62,94 175 20-

In the evaluation of PEF values, the average post hemodialysis was lower than in the pre hemodialysis. Despite that, when evaluated separately PEF, 49,09% persons were increasing the value of EFP, with a mean increase of 0,95 L/s. 47,27% people decreased the value of EFP after hemodialysis on average 0,71 L/s and two people held the same post hemodialysis value.

As EFP characterized the degree of airway obstruction, 36,36% people had increased resistance of pre hemodialysis airways in rating between 50-80% and 27,27% people in the classification below 50%. Post hemodialysis, there was an increase of people with increased resistance in the rating below 50% to 36,36%.

When comparing the average of the pre and post hemodialysis EFP, the p value was 0,18 no statistically significant difference.

Sixteen (29%) people had respiratory disorders in pre hemodialysis, in which four were mixed lung disease all mild and twelve people had obstructive lung disease and six mild and six moderate. People who presented mixed respiratory disorder, two people remained the same disorder and two others changed to the normal post hemodialysis spirometry. People who had obstructive lung disease, four changed from moderate to light three remained in mild and three changed to normal spirometry post hemodialysis, as shown in Table 2.

Table 2 - Pre hemodialysis ventilatory disorders with post hemodialysis change.

	Pre Hemodialysis	Post Hemodialysis
Normal espirometry		5
Mild mixed lung disease	4	2
Mild obstructive lung disease	6	7
Moderate obstructive lung disease	6	2

DISCUSSION

It was found that most of the sample was male in this study. The Census Dialysis (2013) also showed a predominance of males among people on hemodialysis in Brazil, as well as in studies of Rocha and Araújo (2010) and Figueiredo et al. (2008) also had a male predominance.

Godinho et al. (2006) evaluated people with CKD on hemodialysis, and found that the average age was 55 years and the most prevalent age group between 40 and 69 years, totaling 63,3%. Figueiredo et al. (2008) also evaluated lung function in people who underwent hemodialysis and the predominant age group was between 50 and 59 years.

Lung function was impaired in 29% of study participants, which were mixed and obstructive lung disease in mild and moderate levels. Cury, Brunetto and Aydos (2010) evaluated the lung function and functional capacity compared in three groups, dialysis group, transplantation group and control group. They concluded that the group dialysis although not present values below the expected minimum, had lower FVC and FEV1 compared to other groups, averaging 91,17% predicted FVC and the 91,13% of predicted FEV1 and obtained a case of mixed disorder and seven cases of restrictive lung disease. Ventilatory disorders diagnosed in the study of Cury, Brunetto and Aydos (2010) were different because this study was the prevalence of obstructive disorder.

In the study of Fahur et al. (2010) it was evaluated the effects of a physical activity program for eight weeks on lung function in 27 people with CKD between 35 and 75 years who underwent hemodialysis and concluded that FVC and FEV1 were below the predicted values before the program physical activity without post program change. The mean FVC values (2,66L) and FEV1 (2,15L) in the study of Fahur et al. (2010) were even lower in this study but not ranked ventilatory disorders of the evaluated people.

Other researchers, Bianchi et al. (2009) evaluated the lung function in 33 people with CKD before and after hemodialysis session. In pre hemodialysis period 30% of people had restrictive lung disease, 9% mixed and 24% obstruction after the procedure obtained decrease in the number of abnormal spirometry, 21% with restrictive lung disease, 6% and 21% mixed obstructive. The prevailing disorder in the study of Bianchi et al. (2009) was the restrictive lung disease, totaling 71% of people with abnormal breathing pattern.

In a review of literature in order to elucidate the respiratory and renal changes in individuals with CKD, the author discloses that individuals with CKD hemodialysis present fibrosis, pulmonary calcification and pulmonary edema, which is directly associated with restrictive standards and reduction of airflow observed in tests such as spirometry. This edema in the lung is primarily a result of these people generally hypervolemia, arising from interdialytic periods and low albumin levels (Pearson, 2006).

Kovelis et al. (2008) also showed improved results of CFV and FEV1 after hemodialysis, and eight people who had mild restrictive lung disease in the study of these researchers, two normalized lung function. People studied did not achieve FVC

and FEV1 lower than expected as observed in this study.

In the study of Karacan et al. (2004), we evaluated the functional changes in lung mechanics 20 CKD patients in pre and post hemodialysis moment, including laboratory tests. Found in pre hemodialysis moment a predominance of mixed disorder, and associated with low serum sodium content in these people, which leads to fluid overload and pulmonary congestion, found on chest X-ray examinations, and increased vascular resistance due to chronic vascular congestion . After hemodialysis only one person had obstructive disorder and a mixed disorder person, and found an increase in FEV1, and pre and post hemodialysis 86% hemodialysis 87,6%, and expiratory flow, 79,3% pre and 83,1 % post hemodialysis. They concluded that the improvement in spirometric values found may be due to reduced blood volume and consequent improvement in pulmonary congestion.

In another study, there was comparison of lung function among a group of 15 children and adolescents with CKD undergoing conservative treatment with 15 people forming a control group without impaired renal function. They found that the group of children and adolescents with CKD had significantly lower values of FEV1/FVC ($p = 0.003$), but with values within the limits of clinical normality (Coelho et al., 2008). The study in question was conducted in adults, but is observed from this study with children and adolescents there is a tendency to declination of even greater spirometric values when associated with CKD with age.

Analyzing the EFP, more than half of the participants (63,36%) showed increased airway resistance in this study. In the study Schardong, Lukrafka and Garcia (2008) evaluated 30 persons undergoing hemodialysis and demonstrated that they had lower values of EPF in pre dialysis on average 4,08 L / min, reaching 61% of predicted values.

Censi et al. (2011) evaluated 30 people with CKD who underwent hemodialysis treatment. Achieved even greater results, with 90% of participants showing expiratory flow limitation reaching an average of 59,08% of predicted values.

CONCLUSION

People with CKD undergoing dialysis treatment in this study with compromised lung function initially pre hemodialysis period prevalence of obstructive lung disease and mixed in mild and moderate levels. However most people changed the results to a normal spirometry or decreased the degree of lung disease assessed by spirometry.

Lung function improved after hemodialysis treatment, because changes in FVC and FEV1 were observed in this study. The CVF in almost half of participants increased after hemodialysis, and in some situations normalized values. The FEV1 results were even better demonstrated in the increase of their values and also for normalization of their values in some cases.

The majority of the sample showed an increase in airway resistance measured by the PEF pre dialysis time and there was a decrease in values after dialysis thus demonstrating an obstructive airways process.

Based on the changes found, it is important to conduct interventions in people with CKD, in order to provide adequate monitoring of lung function, promote promotion and prevention of health risks activities, reducing the harmful effects on the respiratory system caused by hemodialysis.

The insertion of a physical therapist in the multidisciplinary team working with these people would be very important to act in cardiorespiratory, neurological and musculoskeletal disorders, providing improved endurance, functional capacity improves and independence in activities of daily living of people with CKD.

Keywords: Respiratory Assessment. Spirometry. Chronic Renal Failure.

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SPIROMETRIC EVALUATION PRE AND POST HEMODIALYSIS TREATMENT

Abstract: This study aimed to compare spirometry measurements before and after hemodialysis treatment. It was a quantitative and descriptive study in a foundation for treatment of people with chronic kidney disease. Data were analyzed using simple descriptive statistics and comparative through the Student t test. The study included 55 people with an average age of 55,616,07 years. The average value obtained from the forced vital capacity, forced expiratory volume in one second, index of Tiffeneau and peak expiratory flow was pre hemodialysis 4,47L, 2,67L, 62,49% and 4,98L/s respectively. And after hemodialysis was 4,56L, 2,73L, 62,04% and 4,66L/s, respectively. The mean forced vital capacity and forced expiratory volume in one second increased after hemodialysis and index of Tiffeneau and peak expiratory flow decreased. All variables compared statistically no significant difference. It was found in this study that after hemodialysis there was improvement in lung function and reversibility of lung disease in post hemodialysis.

Keywords: Respiratory Assessment. Spirometry. Chronic Renal Failure.

PRE ÉVALUATION SPIROMÉTRIE ET TRAITEMENT POST HÉMODIALYSE

Résumé: Cette étude visait à comparer les mesures de spirométrie avant et après le traitement d'hémodialyse. Il était une étude quantitative et descriptive dans une fondation pour le traitement des personnes atteintes d'une maladie rénale chronique. Les données ont été analysées à l'aide de statistiques descriptives simples et comparative par le test t de Student. L'étude a inclus 55 personnes avec un âge moyen de 55,616,07 ans. La valeur moyenne obtenue à partir de la capacité vitale forcée, le volume expiratoire en une seconde, indice de Tiffeneau et débit expiratoire de pointe était pré 4,47L d'hémodialyse, 2,67L, 62,49% et 4,98L/s respectivement. Et après l'hémodialyse était 4,56L, 2,73L, 62,04% et 4,66L/s, respectivement. La moyenne capacité vitale forcée et le volume expiratoire en une seconde augmentation après hémodialyse et indice de Tiffeneau et le débit expiratoire de pointe diminué. Toutes les variables comparées statistiquement aucune différence significative. Il a été constaté dans cette étude que, après l'hémodialyse il y avait une amélioration de la fonction pulmonaire et la réversibilité de la maladie pulmonaire en post hémodialyse.

Mots-clés: Évaluation respiratoire. Spirométrie. l'insuffisance Rénale Chronique.

EVALUACIÓN ESPIROMÉTRICA PRE Y POST TRATAMIENTO DE HEMODIÁLISIS

Resumen: Este estudio tuvo como objetivo comparar las mediciones de espirometría antes y después del tratamiento de hemodiálisis. Fue un estudio cuantitativo y descriptivo en una fundación para el tratamiento de personas con enfermedad renal crónica. Los datos fueron analizados utilizando estadística descriptiva y comparativa simples a través de la prueba t de Student. En el estudio participaron 55 personas con una edad media de 55,616,07 años. El valor medio obtenido de la capacidad vital forzada, el volumen espiratorio forzado en el primer segundo, indice de Tiffeneau y el flujo espiratorio pico fue pre hemodiálisis 4,47L, 2,67L, 62,49% y 4,98L / s, respectivamente. Y después de la hemodiálisis fue 4,56L, 2,73L, 62,04% y 4,66L / s, respectivamente. La media de la capacidad vital forzada y el volumen espiratorio forzado en un segundo aumento después de la hemodiálisis y indice de Tiffeneau y flujo espiratorio máximo disminuyeron. Todas las variables compararon estadísticamente ninguna diferencia significativa. Se encontró en este estudio que después de la hemodiálisis se observó una mejoría de la función pulmonar y la reversibilidad de la enfermedad pulmonar en la hemodiálisis posterior.

Palabras clave: Evaluación Respiratoria. La Espirometría. Insuficiencia Renal Crónica.

AVALIAÇÃO ESPIROMÉTRICA NO TRATAMENTO DE HEMODIÁLISE

Resumo: Objetivou-se comparar medidas do teste espirométrico no pré e pós tratamento de hemodiálise. Foi um estudo quantitativo e descritivo, realizado em uma fundação para tratamento de pessoas com doença renal crônica. Os dados foram analisados com estatística descritiva simples e comparativa através do teste t de Student. Participaram do estudo 55 pessoas, com idade média de 55,616,07 anos. O valor médio obtido da capacidade vital forçada, do volume expiratório forçado no primeiro segundo, indice de Tiffeneau e do pico de fluxo expiratório pré hemodiálise foi de 4,47L, 2,67L, 62,49% e 4,98L/s, respectivamente. E pós hemodiálise foi de 4,56L, 2,73L, 62,04% e 4,66L/s, respectivamente. As médias da capacidade vital forçada e do volume expiratório forçado no primeiro segundo aumentaram pós hemodiálise e do indice de Tiffeneau e do pico de fluxo expiratório diminuíram. Todas as variáveis estudadas quando comparadas estatisticamente não apresentaram diferença significativa. Verificou-se neste estudo que após a hemodiálise houve melhora da função pulmonar e reversibilidade do distúrbio ventilatório no pós hemodiálise.

Descritores: Avaliação respiratória. Espirometria. Insuficiência renal crônica.