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Original Article

Is there any association between microalbuminuria and Parkinson's disease?

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Abstract

Aim: To investigate microalbuminuria in patients with Parkinson's disease (PD) and to determine its relationship with the stages of the disease. Parkinson's disease (PD) is a chronic neurodegeneration of dopaminergic neurons in the substantia nigra. The reason for the death of these neurons is still unclear; however, studies have demonstrated the potential involvement of mitochondria, endoplasmic reticulum in contributing to cellular oxidative stress.

Material and Methods: Thirty-two PD patients who admitted to Neurology Clinic of Kirikkale University's Medical Faculty and 30 healthy volunteers whose age and sex-matched were included in the study. Urine creatinine and urine albumin levels were determined in patient and healthy groups. The disease duration and Hoehn and Yahr stages were recorded.

Results: There was no statistically significant difference between urine creatinine, microalbumin, and urine creatinine/albumin ratios when PD patient results compared with the healthy volunteers'. There was no significant correlation among urine creatinine, microalbumin, and urine creatinine/albumin ratio between the disease duration and Hoehn and Yahr staging in patients with PD.

Conclusion: Microalbuminuria is an indirect finding of oxidative stress in urine. In the current study, microalbuminuria was not detected in PD patients at various stages of the disease. It is an important finding that microalbuminuria, a marker of oxidative stress in the urine in PD, a disease in which oxidative stress plays a significant role in etiopathogenesis, is not found.

Keywords: Hoehn and Yahr Scale;microalbumin; oxidative stress; Parkinson's disease; Urine creatinine.

INTRODUCTION

Idiopathic Parkinson's disease (PD) is a progressive neurodegenerative disease characterized by bradykinesia, resting tremor, and rigidity (1). It is known pathologically that dopaminergic cell loss occurs in the substantia nigra pars compacta (SNc). In the pathogenesis of this cell destruction; protein toxicity, defective proteolysis, mitochondrial dysfunction, abnormal iron metabolism, immunological, and inflammatory hypothesis, as well as oxidative stress, are frequently mentioned (2). Therefore, oxidative stress indicator molecules such as superoxide dismutase, catalase, and glutathione peroxidase tried to be observed in peripheral blood to be used as biomarkers in PD, yet, the results are not consistent(3). It has also been suggested that serum vitamin c levels may be an indicator of antioxidant activity in PD (4). However, there are no studies showing that microalbuminuria, which can be used as a marker of oxidative stress in urine, has previously been used as a marker of oxidative stress in patients with PD.

Microalbuminuria is defined as the detection of albumin in urine more than normal levels and is a common indicator of vascular endothelial dysfunction and an independent risk parameter for cardiovascular disorders (5). It has also been reported in previous studies that microalbuminuria can be a biomarker showing oxidative stress (6).

The aim of this study is to investigate microalbuminuria in patients with PD and its correlation with Hoehn and Yahr scale, to show whether microalbuminuria that can show oxidative stress in peripheral tissue can be used as an oxidative stress marker in PD, in which oxidative stress plays an important role in the pathogenesis, or not.

MATERIAL and METHODS

Patients included in the study were randomly selected from the patients that are admitted to the neurology polyclinic

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of the Kirikkale University Medical Faculty Hospital. Ethics committee approval and informed consent form from the patients were obtained. The study included 32 adults with idiopathic PD and 30 healthy controls. The control group was formed from healthy adults appropriate in terms of age and sex. Demographic features, age, sex, duration of disease, and Hoehn and Yahr scale were recorded.

Exclusion criteria included kidney disease, congestive heart failure, diabetes mellitus, respiratory diseases, infectious diseases, liver failure, and malignancy.

Urinary albumin and creatinine level measurements and prediction of albumin excretion rates have been previously described. Monoclonal antibodies against human albumin are used to detect albumin levels by nephelometry. The previously published formula, i.e., the Jaffe method, was used to determine creatinine levels. The urinary albumin-creatinine ratio is calculated with the formula [urine albumin (mg)] / k [urine creatinine (g)] accepting k as a correction factor based on sex and race (7). Urinary albumin-creatinine ratio being as >30 mg/g in women and >20mg/g in men while upper limit as 299 mg/g in both sexes is defined as microalbuminuria (8).

SPSS version 16.0 was used to analyze the results. The p-value <0.05 was considered statistically significant. The distribution of continuous variables was evaluated by Kolmogorov Smirnov test. Categorical variables were expressed as ratios. Student's t-test and chi-square test were used to test the differences. Pearson analysis was used to investigate the correlation between Hoehn and Yahr scale and urinary albumin-creatinine ratio, microalbumin, and urine creatinine.

RESULTS

Urine creatinine, microalbumin, and urine creatinine/albumin ratios in the patient and control groups were presented in Table 1. There was no significant difference in urine creatinine, microalbumin, and urine creatinine/albumin ratios between PD patients and controls.

In Table 2 and 3, the relationship between the disease stage and the duration of disease with urine creatinine, microalbumin, and urine creatinine/albumin ratios are presented. There was no correlation between disease stage and duration of disease with urine creatinine, microalbumin, and urine creatinine/albumin ratios in patients with PD is detected.

Table 1. Demographic and clinical parameters in patient and control groups

	Control (n=30)	Patient (n=32)	p
Age	64.0±6.9	66.8±8.3	0.161
Sex (Female/Male)	9/21 (30%/70%)	10/22 (31.3%/68.8%)	1.000
Urine Creatinine/Albumin Ratio	20.8±27.9 10.2 [2.8–135]	51.3±169.6 7.7 [1.6–940]	0.460
Urine Creatinine	165.8±69.7 149 [71–378]	159.9±78.5 153 [64–369]	0.545
Microalbumin	2.8±3.5 1.3 [0.2–14.6]	4.0±10.7 1.1 [0.3–60.2]	0.587

Table 2. The relation of stage and duration with other parameters in the patient group

	Duration		Hoehn and Yahr score	
	Correlation coefficient	p	Correlation coefficient	p
Correlation coefficient	P	Correlation coefficient	p	0.636
Urine Creatinine	0.126	0.492	-0.334	0.061
Microalbumin	0.138	0.452	-0.050	0.787

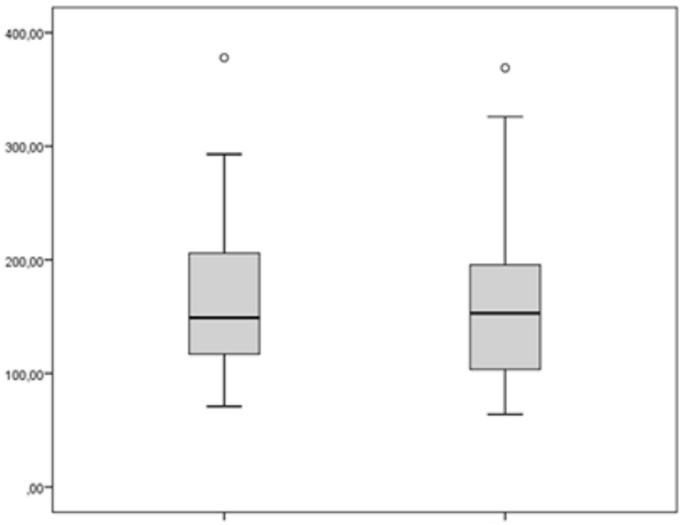

Table 3. Urinary creatinine levels of patient and control group

DISCUSSION

Microalbuminuria is a commonly used measure in clinical practice as an important marker of early renal and cardiovascular pathology and oxidative stress. However, there are not enough studies investigating its relationship with neurodegeneration. A recent study has suggested that it may be associated with early retinal neurodegeneration in diabetic patients (9). Retinal ganglion cell layer has been shown to be thinner in cases with microalbuminuria compared to healthy controls. In a recent study by us, the relationship between multiple sclerosis, a disease with neurodegeneration, and microalbuminuria was investigated but no significant correlation was found (10). Although the risk factors such as systemic hypertension, diabetes mellitus, and hyperlipidemia are not found in Alzheimer's disease, which is a common neurodegenerative disease especially in advanced age, it has been suggested that the incidence of higher microalbuminuria than normal healthy population is identified (11). This finding showed that microalbuminuria may correlate with neurodegeneration.

Microalbuminuria has been shown to be associated with systemic endothelial dysfunction (12). The presence of microalbuminuria with extrarenal vascular damage revealed this hypothesis. Endothelial dysfunction can be expressed as a deterioration of the normal endothelial structure necessary to maintain organ function. It provides normal endothelial homeostasis in physiological conditions. It reduces normal healthy endothelial vascular

tone, regulates vascular permeability, limits platelet adhesion and aggregation, inhibits coagulation cascade activation, and limits leukocyte adhesion. It has been suggested in clinical studies that endothelial dysfunction may be present in the etiopathogenesis of PD (13). It has been shown that capillary structure is impaired even in the early stages of PD and normal relationship between nigral neurons and capillary structure is impaired. In this respect, it would be meaningful to look for microalbuminuria, a marker of endothelial dysfunction, in PD. However, in the current study, microalbuminuria was not found in PD patients at different stages with normal renal function.

CONCLUSION

In the present research, there was no statistically significant difference in urine creatinine/albumin and microalbumin levels in PD patients compared to healthy volunteers. These findings show that these parameters cannot be used as biomarkers in terms of PD, but this finding has shown that renal function is not impaired even in the advanced stages of PD. It may also be thought that oxidative stress, previously shown in serum, may not produce a symptom in urine in PD, a neurodegenerative disease in which oxidative stress known to have a role in its pathogenesis. However, there are many molecules in the serum that can be a marker of oxidative stress. Urine screening of these molecules may reveal new biomarkers for PD.

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REFERENCES

1. Fahn S, Przedborski S. Parkinsonizm. In: Rowland LP, ed. Merritt's Textbook of neurology. 10 th ed. Philadelphia, Md: Lippincott Williams & Wilkins; 2000:679-93.
2. Hwang O. Role of oxidative stress in Parkinson's disease. Exp Neurobiol 2013;22:11-7.
3. Vinish M, Anand A, Prabhakar S. Altered oxidative stress levels in Indian Parkinson's disease patients with PARK2 mutations. Acta biochim Pol 2011;58:165-9.
4. Medeiros MS, Schumacher-Schuh A, Cardoso AM, et al. Iron and oxidative stress in Parkinson's disease: an observational study of injury biomarkers. PLoS One 2016;11:e0146129.
5. Garg JP, Bakris GL. Microalbuminuria: marker of vascular dysfunction, risk factor for cardiovascular disease. Vasc Med 2002;7:35-43.
6. Vicentini J, Valentini J, Grotto D, et al. Association among microalbuminuria and oxidative stress biomarkers in patients with type 2 diabetes. J Investig Med 2011;59:649-54.
7. Jacobs DR, Murtaugh MA, Steffes M, et al. Gender and race specific determination of albumin excretion rate using albumin-tocreatinine ratio in single, untimed urine specimens. The study of coronary artery risk development in young adults. Am J Epidemiol 2002;155:1114-9.
8. Casanova C, de Torres JP, Navarro J, et al. Microalbuminuria and hypoxemia in patients with chronic obstructive pulmonary disease. Am J Respir Crit Care Med 2010;182:1004-10.
9. Farias LB, Lavinsky D, Benfica CZ, et al. Microalbuminuria ıs associated with early retinal neurodegeneration in patients with type 2 diabetes. Ophthalmic Surg Lasers Imaging Retina 2018;49:e36-e43.
10. Alpua M, Turkel Y, Dag E, Kisa U.Is there any association between microalbuminuria and multiple sclerosis?. Neurology Asia 2016;21:295-7.
11. do Carmo FS, Pires SL, Gorzoni ML, et al. Cognitive and renal dysfunction in the elderly. Dement Neuropsychol 2013;7:397-402.
12. Ochodnicky P,Henning RH, van Dokkum RP, de Zeeuw D. Microalbuminuria and endothelial dysfunction: emerging targets for primary prevention of end-organ damage. J Cardiovasc Pharmacol 2006;47:151-62.
13. Muller T, Werne B, Fowler B, et al. Nigral endothelial dysfunction, homocysteine, and Parkinson's disease. Lancet 1999;354:126-27.