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Original Research Article

Study of Autonomic Neuropathy in Cardiovascular System in Chronic Renal Failure Patients on Maintenance Hemodialysis

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Abstract: Autonomic nervous system abnormalities are major causes of morbidity and mortality in patients with chronic renal failure (CRF) on hemodialysis and are generally considered a part of polyneuropathy. Postural hypotension, impotency, gastrointestinal disturbance, gastrointestinal motility, and sweating abnormalities are common symptoms. The most frequent complication in patients with CRF on hemodialysis is intradialytic hypotension, and it has been suggested that intradialytic hypotension is mostly related to autonomic neuropathy. The pathogenesis of autonomic neuropathy is unclear, but a reduced response to norepinephrine by the end organ and the toxic effect of metabolic toxins are considered to be some of the causes. Five cardiovascular reflex tests are generally used to determine autonomic neuropathy: the heart rate reaction to the Valsalva Maneuver, the heart rate variability during deep breathing, the heart rate response to standing up, the blood pressure response to standing up, and the blood pressure response to hand grip exercise.

Keywords: Autonomic nervous system, chronic renal failure, hemodialysis, polyneuropathy.

INTRODUCTION

Autonomic nervous system abnormalities are major causes of morbidity and mortality in patients of chronic renal failure (CRF) on hemodialysis and are generally considered a part of polyneuropathy. Postural hypotension, impotency, gastrointestinal motility, and sweating abnormalities are considered common symptoms.

The goal of our study is

- To study relationship between autonomic neuropathy in cardiovascular system in chronic
- Renal failure patients on maintenance hemodialysis.
- To significantly decrease the morbidity and mortality due to autonomic neuropathy in cardiovascular system in chronic renal failure patients on hemodialysis.

MATERIALS AND METHOD

We conducted five tests for autonomic neuropathy: heart rate in synchrony with Vasalva maneuver, heart rate during deep breathing, pulse rate during standing up and B.P. while getting up while gripping a handhold. Each subject scored 0,1, or 2, based on their normality, borderline status, or abnormality assessment. An autonomic neuropathy is characterised by a score of 5 or higher. During this study, there were 170 subjects of Chronic Renal Failure, receiving hemodialysis. Diabetes mellitus and other etiologies that might cause autonomic neuropathy had not been observed in the study participants. The data processing was performed using Excel software.

RESULT

A total of 151 patients had abnormal autonomic reflex tests. There were no significant correlations among patients with autonomic dysfunction and aging, hemodialysis duration, urea clearance total protein, ferritin levels, calcium concentration, phosphorous concentration, parathyroid hormone, hemoglobin content and Vitamin D dosage. The abnormal test results were as follows: abnormal heart rhythms underwent in reaction to Valsalva Maneuver in 135 (89%) individuals, heart rate fluctuation after deep breaths in 144 (95%) cases, standing up blood flow response in 131 (86%) individuals, and hand grip response in 136 (90%) subjects, 127 (85%) cases of standing blood flow impact. Five tests were performed,

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and the three most abnormal results were the heart rate fluctuation after shallow breath, Valsalva maneuver, and the BP change after hand gripping.

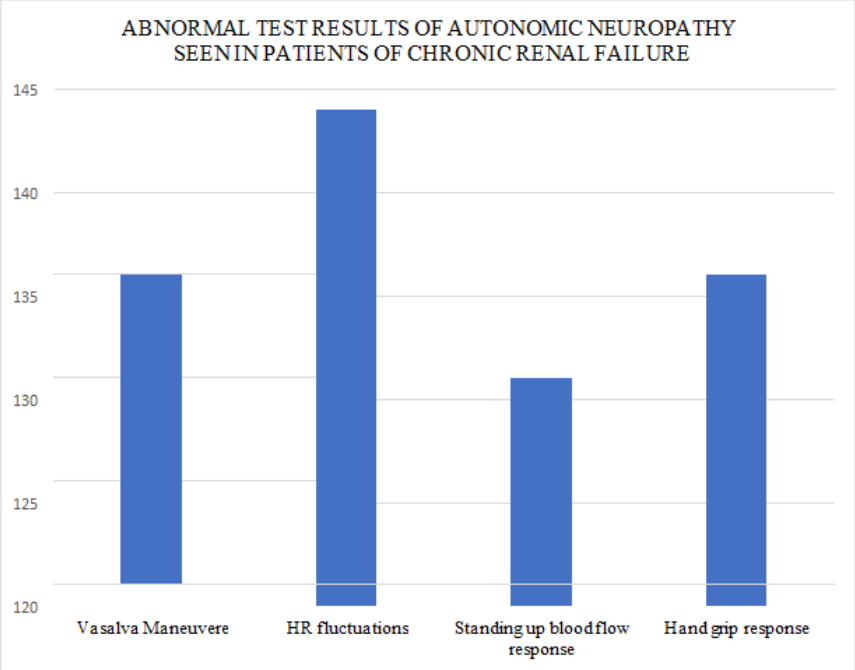

Table 1: Neural pathway some standardized autonomic tests

TEST EVALUATED	PROCEDURE	AUTONOMIC FUNCTION
HRBD	6 deep breaths/min	Cardiovagal function
Valsalva ratio	Expiratory pressure, 40mmHg for 1-15s	Cardiovagal function
QSART	Axon-reflex test:4 limb sites	Postganglionic sudomotor function
BP to VM	BP response to VM	Adrenergic function; baroreflex adrenergic control of vagal and vasomotor function
HUT	BP and heart rate response to HUT	Adrenergic and cardiovagal response to HUT

DISCUSSION

Autonomic neuropathy is a particular complication of CRF and it is a part of polyneuropathy. The cause of it is not clear. In a few multicentric studies maintenance hemodialysis has shown to reduce autonomic neuropathy while in some it didn't. In our study group we found that autonomic neuropathy in cardiovascular system was present in 88.82% of the subjects; which is significantly higher than the previous studies. In this study we hypothesized that autonomic neurpathy is related more to the duration and severity of CRF than to the time and age dialysis initiation. Based on five tests we conducted on subjects, 151 patients had abnormal test results. We arrived at a result that out of five tests for study, one test can be abnormal in CRF patients on maintenance hemodialysis. 88.82% patients had more than 3 tests positive. Abnormal heart rate response to deep breathing is the test having highest sensitivity. Research done on this topic in past were not able to correlate relationship between duration of hemodialysis and dysfunction in autonomic nervous system. In this study we try to form relationship between the autonomic dysfunction and duration of hemodialysis. Though the study population was small, we found the factors affecting autonomic neuropathy. The tests were performed to diagnose autonomic neuropathy in cardiovascular system in CRF patients on maintenance hemodialysis.

CONCLUSION

Autonomic neuropathy in cardiovascular system is a well established complication in patients of CRF on maintenance hemodialysis.

In our study we used 5 different tests to diagnose autonomic neuropathy. 88.82% patients were found to have more than 3 tests positive indicating autonomic neuropathy in cardiovascular system in CRF patients on maintenance hemodialysis.

Heart rate variability to deep breathing is on test having high sensitivity and can be used to detect autonomic neuropathy in cardiovascular system in CRF patients on maintenance hemodialysis.

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