ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

CARDIOVASCULAR AUTONOMIC NEUROPATHY SCORINGS IN CHRONIC RENAL FAILURE PATIENTS

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Manuscript Info

Manuscript History:

Received: 12 June 2013
Final Accepted: 22 June 2013
Published Online: July 2013

Key words:
Non-invasive methods,
cardiovascular autonomic neuropathy
cardiac death,
valsalva maneuver
postural hypotension

Abstract

Long-term kidney problems are associated with an increased risk of cardiovascular disease. Several abnormalities in cardiovascular autonomic function have been found in CRF patients. So the study on cardiovascular autonomic neuropathy scorings in patients of chronic renal failure was taken up.

Methods:A study was done to find clinical profile of autonomic neuropathy in chronic renal failure patients.Detailed clinical evaluation and following tests to know autonomic functions were done.Heart rate variability in response to deep breathing, heart rate variability in response to standing, heart rate in response to valsalva maneuver, postural hypotension and BP response to sustained hand grip exercise were done. Values obtained from the various tests were tabulated into a worksheet and a scoring system was applied to each test.

Result: The mean cardiovascular autonomic neuropathy (CAN) score for diabetic patients was more than the other etiologies. The mean score in chronic renal failure patients with systemic symptoms had significantly higher values compared to those without symptoms**.**

Conclusion: Gradings of cardiac autonomic dysfunctions in patients of chronic renal failure by using non- invasive methods will be helpful for clinicians to prevent sudden cardiac death.

Introduction

Chronic kidney failure also known as chronic renal failure affects over250,000 Americans annually. It is caused by a number of diseases and inherited disorders, but the progression of chronic kidney failure is always the same. The kidneys, which serve as the body's natural filtration system, gradually lose their ability to remove fluids and waste products (urea) from the bloodstream leading to End Stage Renal Disease (ESRD). The clinical constellation of signs & symptoms of end stage renal failure is known as the "Uremic Syndrome".[1]The uremic syndrome results from derangements of function of nearly all organ systems of the body. Central, peripheral and autonomic neuropathies, as well as abnormalities in muscle composition and function, are all common complications of CRF.

Long-term kidney problems are associated with an increased risk of cardiovascular disease[2].Several abnormalities in cardiovascular autonomic function have been found in CRF patients. Although neuropathy was described first by Rundles in 1949. [3]Its early recognition remains a challenge. This is mainly because it does not have any pathognomonic symptoms. Patients develop symptoms late in the course of the disease. Symptoms of uremic neuromuscular disease do not become manifest until beginning of stage 3 CRF.[4]It may have a number of clinical squealae, but the pathogenesis is unknown.[5,6,7]

Clinical symptoms of autonomic neuropathy such as gustatory sweating , those related to

enteropathy, cystopathy and orthostatic hypotension are rare. On the other hand asymptomatic abnormalities are not uncommon after 10-15 years' duration of chronic kidney disease.[8]In recent years there has been a growing interest in the cardiovascular autonomic neuropathy in chronic renal failure because of its association with increase in mortality in these patients. So the study on cardiovascular autonomic neuropathy scorings in patients of chronic renal failure was taken up.

MATERIALS AND METHODS

A study was done in KMC associated hospitals from June 2009 to February 2011 to study the clinical profile of autonomic neuropathy in patients of chronic renal failure.Inclusioncriterias: All patients of 15 to 60 years of age meeting the criteria of chronic renal failure as defined by National kidney foumdation[9] are included in the study. Exclusioncriterias: Those who are on drugs that affect autonomic nervous system like beta blockers, catecholaminesetc, patients having neurological diseases that affect autonomic system e.g. CVA, Parkinson's disease, GB syndrome,patients who have severe illness of other systems e.g. CCF, respiratory failure and the patients who are moribund and cannot perform valsalvamanoeuvre.patients who fulfilled the inclusion criteria were enrolled into the study .100 patients were evaluated thoroughly using a pre- tested proforma. The evaluation comprised of detailed clinical history, a thorough clinical examination and the following clinical tests for autonomic neuropathy were done. Heart rate variability in response to deep breathing, heart rate variability in response to standing, heart rate in response to valsalva Maneuver, postural hypotension and BP response to sustained hand grip exercise. Values obtained from the various tests are tabulated into a worksheet and a scoring system was applied to each test as recommended by Bellavereet al.[10]Values were compared using unpaired- t test. P value <0.01 considered as statistically significant.

Scoring system recommended by Bellavere et al

TEST	SCORE		
	0 (Normal)	1(Borderline)	2(Abnormal)
Heart rate variability	> 15	10-15	< 10
Valsalva ratio	≥ 1.21	1.11-1.20	≤ 1.10
30:15 ratio	≥ 1.04	1.01-1.03	≤ 1/00
BP response to standing	≥ 10mm Hg	11-29 mm Hg	≥ 30mm Hg
BP response to handgrip (diastolic BP)	≤ 16mm Hg	11-15 mm Hg	≤ 10mm Hg

Categorization of patients based on the CAN score

CAN SCORE	CATEGORY
0-1	No autonomic neuropathy
2-4	Early autonomic neuropathy
>/= 5	Severe autonomic neuropathy

The sum of the score obtained from each test determined the final classification of the patient's degree of cardiac autonomic neuropathy. The total score ranged from 0 to 10. Classification of patients was done according to the total score.

Result:

Table1: Percentagedistribution of cases of autonomic neuropathy

Percentage distribution of cases	Grades of autonomic neuropathy
58	No
26	Early
16	Severe

Table11: Mean values of various parameters of the CAN score:

Variable	Mean value
Heart rate variability(beat/min)	7.7 ± 3.6
Valsalva ratio	1.11 ± 0.1
30:15 ratio	1.04 ±0.07
Postural drop of BP	18.4 ±11.11 mmHg
Rise in Diastolic BP	12.4 ±4.2mm Hg

TableII1: Mean CAN score in different etiologies:

Diagnosis	Mean CAN score
Diabetes mellitusn(n=43)	3.657
Hypertension (n=21)	1.810
Chronic Glomerulonephropathy (n=7)	0.286
Idiopathic (n=7)	1.857
Obstructive nephropathy (n=13)	0.923
Others (n=9)	1.222

TABLE 1V: CAN scores in different symptoms:

system	With symptoms	Without symptoms	P value
CVS	3.750	1.033	0.001
UROLOGY	4.316	1.605	0.001
GIT	3.025	1.517	0.007

Percentage distribution of autonomic neuropathy in chronic renal failure patients are shown in table1. The mean value of resting heart rate in our study was 102.8 ± 15.3 beats/min whereas the mean value of heart rate variability with respiration was 7.7 ± 3.6 beats/min. The mean valsalva ratio of our patients was 1.11 ± 0.1 and mean value of 30: 15 ratio was 1.04±0.07. The mean postural drop of BP on standing in our study was 18.4±11.11mmHg. The mean CAN score for patients with different etiologies are shown in table111.

The mean CAN score in patients with history of CVS symptoms was 3.750 as compared to 1.033 in patients without CVS symptoms. This observation was highly significant (p value < 0.01). The mean CAN score in patients having urological dysfunction history was 4.316 while in those not having symptoms were 1.605.This observation was very highly significant (p <0 .01) The mean CAN score in patients having GIT dysfunction history was 3.025 while in those not having symptoms were 1.517.This observation is also significan(p<0.01).

DISCUSSION

Diabetes mellitus was the commonest etiology followed by hypertension,obstructive neuropathy, chronic glomerulonephritis and idiopathic CKD in our study.Sanya EO et al in their study found diabetes as the commonest cause for CKD followed by chronic glomerulonephritis.[11]Aggarwal A et al in their study found diabetes and obstructive nephropathy as the leading cause of CKD.[12]

When we analyzed the CAN score with the various etiologies of CRF, mean CAN score in diabetic was 3.657. The mean CAN score in diabetics in studies done by Vita G et el, Laaksonen S et al and Calvo C et al. was 3.923 , 3.426 and 3.124 respectively[13,14,15].Mean CAN score in hypertensive in our study was 1.809. The mean CAN score in hypertension in studies done by Vita G et el, Laaksonen S et al and Calvo C et al. was 2.106, 1.732 and 1.692 respectively.[13,14,15]

In our study we found that in patients with cardiovascular symptoms, urological symptoms and GIT symptoms the mean CAN score was significantly higher compared with those who were asymptomatic Similar findings were observed by Calvo et al ,Sanya et al and Vita G et al in their study found a significant high CAN score in patients with gastrointestinal symptoms[15,11,13].Sudden cardiac death is the one of an important cause of death during dialysis in chronic renal failurepatients.[16]Grading of cardiac autonomic dysfunctions in patients of chronic renal failure by using non- invasive methods will be helpful for clinicians to prevent sudden cardiac death.

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