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Original Research Article

A Study to Identify Preclinical Cardiac Abnormalities in Chronic Heavy Alcohol Consuming Patients using Two-Dimensional and Doppler Echocardiography

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Abstract:

Introduction: Alcohol is a known cardiotoxin, with chronic heavy consumption leading to ACM. This condition can progress from asymptomatic LV dysfunction to symptomatic heart failure. However, the effect of alcohol withdrawal on LV function in patients with congestive heart failure remains unclear. Inconsistent findings in clinical studies may be attributed to methodological variations and patient differences. This study aims to investigate the relationship between the duration of excessive alcohol consumption and LV function using echocardiography.

Aim: To assess the impact of the duration of excessive alcohol consumption on LV function through echocardiography.

Methodology: This prospective study involved ninety asymptomatic chronic heavy alcohol consumers admitted to Base Hospital Delhi Cantt (BHDC) and thirty non-heavy alcohol consumers. Echocardiography was performed using Philips IE-33 with S5 probe. Data analysis followed internationally validated methods. Ethical approval and informed consent were obtained. Key steps included recruitment, detailed history-taking, physical examination, cardiovascular assessment (ECG, Holter monitoring, 2D ECHO), data comparison, and statistical analysis using SPSS version 20.

Results: The study classified ninety male heavy alcohol consumer patients into short (5–9 years), intermediate (10–15 years), and long (>15 years) duration groups, alongside thirty healthy controls. Chronic heavy alcohol consumerS exhibited LV dilation with preserved ejection fraction (EF) and abnormal isovolumic relaxation time (IVRT) and deceleration time (DT) of E pattern, indicating impaired LV relaxation. Diastolic filling abnormalities were more pronounced in patients with longer drinking histories. LV volume changes preceded changes in LV mass and LV diastolic filling impairment.

Conclusion: Chronic excessive alcohol consumption can lead to progressive cardiac dysfunction, primarily affecting the left ventricle. LV dilation and impaired diastolic function were evident in asymptomatic heavy alcohol consumers, with diastolic dysfunction preceding systolic dysfunction in chronic alcoholism. LV relaxation parameters may serve as early indicators of alcohol-induced cardiac abnormalities. Monitoring LV function is crucial for detecting early signs of heavy alcohol consumers cardiomyopathy in chronic heavy alcohol consumers.

Keywords: Heavy alcohol consumer's cardiomyopathy, LV functions, echocardiography, alcohol consumption, cardiac abnormalities, diastolic dysfunction.

Introduction

Alcohol has been considered a cardiotoxin for over a century. Regular heavy ethanol consumption is associated with a form of nonischaemic dilated cardiomyopathy termed heavy alcohol consumers cardiomyopathy (ACM). In general, heavy alcohol consumers patients consuming >90 g of alcohol a day for >5 years are at risk for the development of asymptomatic ACM, which is clinically expressed as an impairment of left ventricular function (non-symptomatic stage). Those who continue to drink may become symptomatic and develop signs and symptoms of heart failure (HF) (symptomatic stage) [1-10]. There is evidence from experimental [11] and human [12] studies that alcohol withdrawal may normalize left ventricular dysfunction, at least in acute or early stages of the disease. Whether this is

true in patients presenting with congestive heart failure and left and right heart dilation with corresponding structural changes [11,12] is not known. In fact, studies [13] reported improved survival in some patients abstaining from alcohol, whereas another study showed no survival benefit from alcohol abstinence in such patients.

Numerous clinical studies that have examined the effect of chronic alcohol consumption on systolic and diastolic LV function have yielded conflicting results [14,15]. To some extent, this may be due to the different methods employed [11-15]. Other possible reasons for these discrepancies may be different diagnostic criteria, failure to exclude other forms of heart disease, different age groups and differences in history of alcohol consumption [14]. The present study intends to address the impact of duration of excessive alcohol consumption on LV function through echocardiography.

Aim

To assess a possible effect of duration of excessive alcohol consumption on LV function through echocardiography.

Objective

To detect preclinical cardiac abnormalities in chronic heavy alcohol consumers patients using two-dimensional and Doppler echocardiography, and

Methodology

A prospective echocardiographic observation study of asymptomatic chronic heavy alcohol consumers admitted in psychiatry ward of Base Hospital Delhi Cantt (BHDC). Study was carried out on ninety asymptomatic chronic heavy alcohol consumers admitted in Base Hospital and thirty non-heavy alcohol consumers' subsets of matching characteristics, after duly obtaining their consent.

The study was carried out over the period of two years starting 01st Oct 2011 to 30th Sep 2013 at Department of Cardiology, Base Hospital, Delhi Cantt. New Delhi. Philips IE-33 with S5 probe was used for this study. M-mode, 2D echocardiogram and Doppler values where applicable was applied. The internationally validated modes of evaluation were followed and annotated as such in analysis of the study. Necessary approval to conduct the study from the institutional ethics committee of Base Hospital, Delhi.

The participants were given a full explanation about the purpose of the study and assurance about the confidentiality of the information and that the participation was optional. All the participants signed the informed consent form.

1) Individuals referred to this hospital with symptoms suggestive of chronic alcohol abuse were prospectively recruited in the study.
2) A detailed history was taken, and a physical examination was done on each study participant.
3) The cardiovascular functions were assessed by noninvasive tests: ECG, 24-hour Holter monitoring (where indicated) & 2D ECHO. The echocardiography was preferably to be carried out at the same cardiac centre.
4) Data collected at the end of the study were compared in patients of cardiomyopathy in chronic heavy alcohol consumers with the age related non-heavy alcohol consumers (control) population.

All the statistical analysis was performed using SPSS version 20. The clinical profile of patients was analyzed by chi-square test for qualitative variables. One way anova test was performed for comparison of quantitative variables. 5% probability level was considered as statistically significant i.e., $p<0.05$.

Results

The present study was carried out in Department of Medicine, Base Hospital (Delhi Cantt), New Delhi. Ninety consecutive male heavy alcohol consumers patients were recruited and were divided into three groups based on the duration of drinking: short (S, drinking history 5–9 years), intermediate (I, drinking history 10–15 years) and long (L, drinking history .15 years) duration groups. Age matched thirty male healthy subjects without any history of drinking or smoking was studied as the control group. None of them had a history of hypertension nor any history, signs or symptoms of diabetes, cardiovascular or lung disease. The mean age of the control and heavy alcohol consumers patients was 40.33 and 40.48 years respectively. Duration of heavy drinking varied from 6 to 20 years. The average daily ethanol consumption was estimated at 94.22 g (range 91.25 to 102.01 g) with average days of consumption of alcohol was approximately 4 days/week.

The mean age of the control and heavy alcohol consumers patients was 40.33 and 40.48 years respectively as seen in Figure 1. Duration of heavy drinking varied from 6 to 20 years. The average daily ethanol consumption was estimated at 94.22 g (range 91.25 to 102.01 g) with average days of consumption of alcohol was approximately 4 days/week. This study demonstrated that chronic heavy alcohol consumers without symptoms and signs of heart disease had LV dilation with preserved EF and abnormal IVRT (isovolumic relaxation time) and DT (deceleration time) of E pattern indicating impaired LV relaxation. Left ventricular diastolic filling abnormalities were more remarkable in patients with longer drinking histories. In this study we found that changes in LV volume occurred

before the changes in LV mass and impairment of LV diastolic filling. This may serve as an early non-invasive echocardiographic indicator of alcohol induced abnormality of cardiac function. However, once alcoholism occurred, the duration of heavy drinking related to diastolic filling parameters but not to systolic indices as seen in Figure 2 and Figure 3.

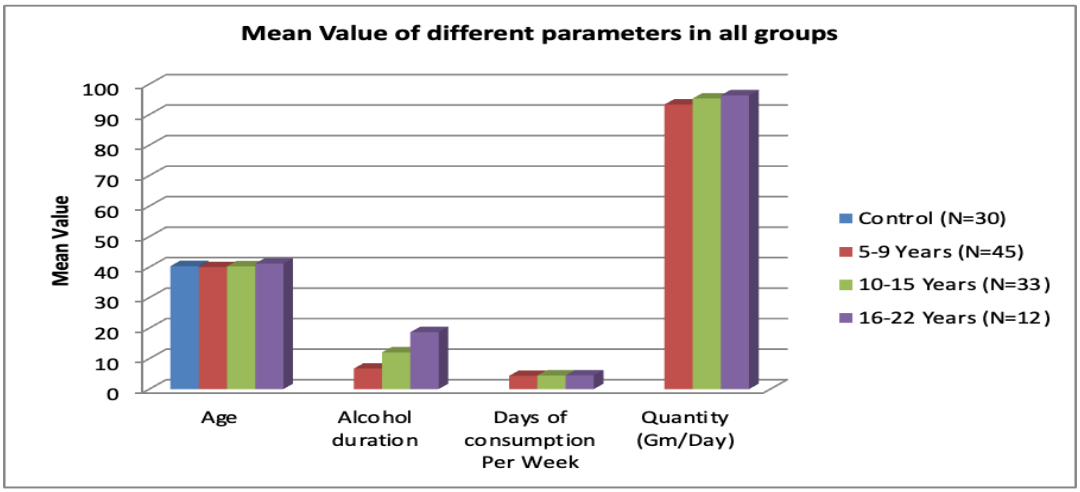

Figure 1: Mean value of different parameters in all groups

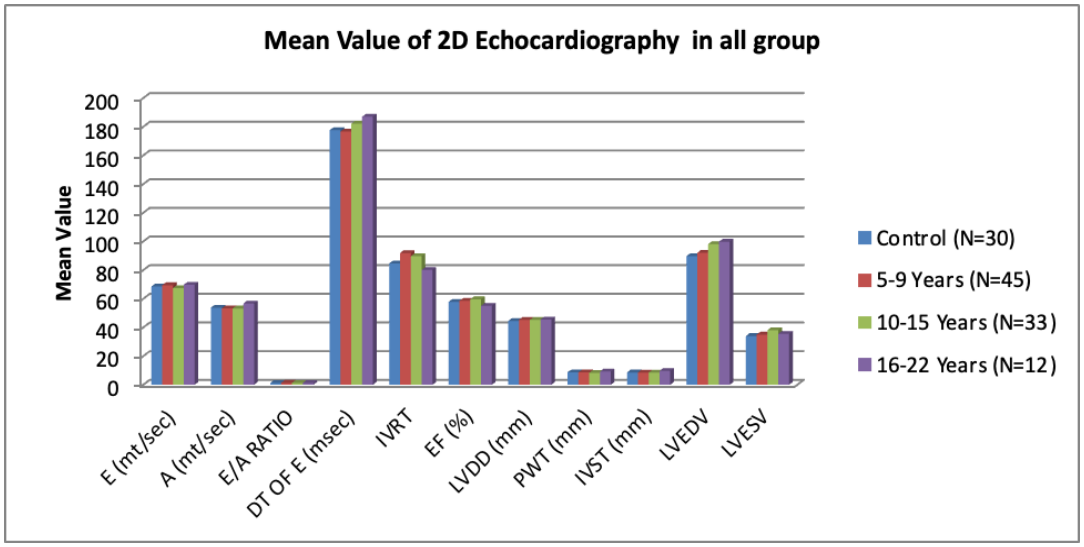

Figure 2: Mean value of 2D Echocardiography in all groups

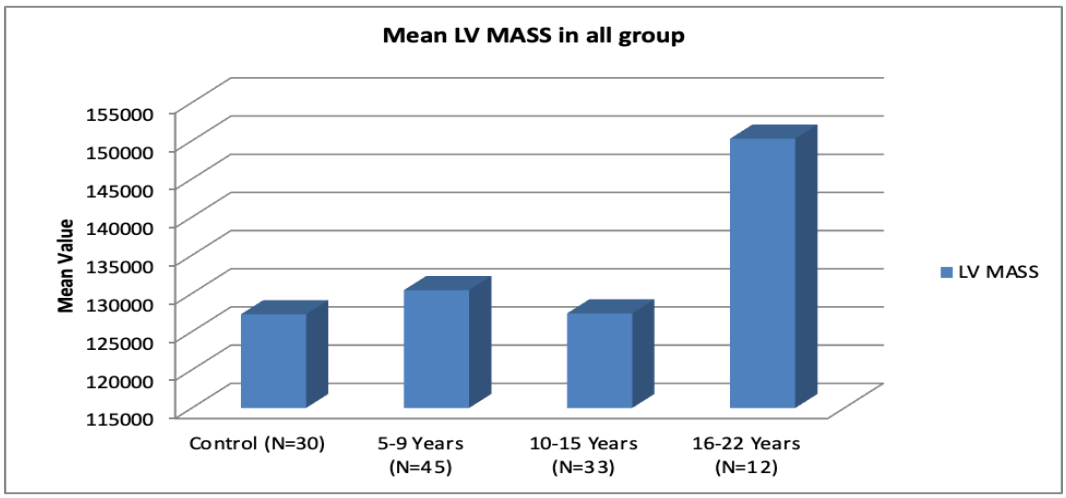

Figure 3: Mean value of LV MASS in all groups

Discussion

It is observed that heavy alcohol consumers cardiomyopathy can often develop after five to ten years of excessive alcohol use [1-5]. However, there is no defined time frame yet available. In heavy alcohol consumers who develop cardiac dysfunction, abstinence is thought to be essential to halt further deterioration of cardiac contractility as has been observed by Segel et al [10]. Abstinence after development of milder HF can stop progression or even reverse symptoms in some cases was noticed in study by Milani et al [11], otherwise severe HF ensues leading to a poor prognosis. Of the hematological parameters, hemoglobin and differential leukocyte count did alter significantly within the normal reference range. The changes observed in these groups were however not clinically significant. Both fasting and post-prandial blood sugar levels did not alter in control subjects and heavy alcohol consumers. Total serum cholesterol was found to be elevated in long term chronic heavy alcohol consumers as compared to the control population which was statistically significant (P value=0.04). Serum HDL levels did not alter in control subjects and heavy alcohol consumers. None of the studied liver function test parameters, serum bilirubin, ALT, AST and GGT, differ significantly between control subjects and heavy alcohol consumers maybe because the subjects were in a period of abstinence for an average of 15 days prior to evaluation. The possible reasons for these discrepancies may be due to differences in the severity of alcoholism or inaccurate information on alcohol consumption. The exact information on the quantities of alcohol consumed was a major problem in most studies because many heavy alcohol consumers tend to underestimate their daily alcohol consumption.

The results of this study show that asymptomatic heavy alcohol consumers had impaired LV relaxation. However, the values of the parameters studied except for LVEDV were not of statistical significance. Conflicting results have also been reported regarding diastolic function of asymptomatic heavy alcohol consumers, these discrepancies may be due to the different method used to assess diastolic function as studied by Spirito P et al [14]. By using M-mode echocardiography Dancy M et al found that LV diastolic diameter increased in chronic heavy alcohol consumers, but no signs of impaired LV diastolic filling [1-10]. Our data revealed no apparent influence of age on EF in the heavy alcohol consumers, even in those with long duration of drinking. Interestingly, we found that heavy alcohol consumers with longer drinking history (L sub group) showed longer DT and higher A than heavy alcohol consumers with shorter duration of alcoholism (S sub group), although the difference did not reveal any statistical significance despite no differences in LV volumes and mass between the two groups. These results suggest that prolongation of LV relaxation may be a sensitive sign that can be used for the assessment of progression of cardiac dysfunction in asymptomatic heavy alcohol consumers. [11-20].

Conclusion

Chronic excessive alcohol consumption may lead to progressive and chronic cardiac dysfunction and can be a possible cause of dilated cardiomyopathy. The dilation is often more pronounced in the left ventricle. Hence the present study was focused to study the effect of duration of excessive alcohol consumption on LV function through echocardiography. In conclusion, the results of this study showed that the earliest manifestation of cardiac abnormalities in asymptomatic heavy alcohol consumers was found to be LV volume changes followed by LV mass increase and impairment of diastolic function. The mechanisms of the volume changes remained unexplained. Diastolic dysfunction has been known to precede systolic dysfunction in some forms of heart failure. Since EF was preserved, even in patients with a long drinking history, it appears that in chronic alcoholism, diastolic dysfunction precedes systolic dysfunction. Chronic asymptomatic heavy alcohol consumers showed LV dilation, which preceded increase in LV mass and impairment of LV relaxation. It appeared that the progression of LV diastolic filling abnormalities related to the duration of alcoholism. It is likely that, in select patients, combination of LV dilation, impaired LV relaxation with preserved EF may indicate a prelude to heavy alcohol consumers cardiomyopathy.

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