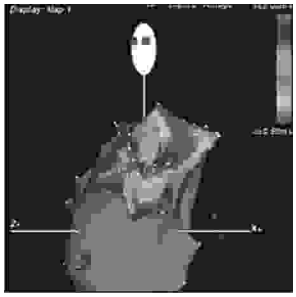
ORIGINAL **PROF-1012**

VENTRICULAR TACHYCARDIA;
PREVALENCE AND PROGNOSIS



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ABSTRACT... drmsgilani@yahoo.com. **Introduction:** Frequent or complex patterns of ventricular ectopic activity, whether occurring during routine activity or induced by exercise, are often a marker for serious heart disease and a harbinger of sudden death. The detection of such arrhythmias is thus an important responsibility of the physician. **Objective:** To find the prevalence, associated characteristics and prognostic significance of exercise induced non-sustained VT in a representative population. **Material and Methods: Setting:** Nishtar Hospital, Multan. **Sample size:** 1000 patients. **Duration:** Two years. **Study design:** Descriptive, analytical study. **Sampling Technique:** Convenient probability sampling done. **Results:** Ten subjects, 7 men and 3 women, with exercise induced VT were identified, representing 1.1% of those tested; only 1 was young than 65 years. All episodes of VT were asymptomatic and non-sustained. In 9 of 10 subjects, VT developed at or near peak exercise. The longest run of VT was 6 beats; multiple runs of VT were present in 4 subjects. Two subjects had exercise induced ST segment depression, but subsequent exercise thallium scintigraphic results were negative in each. Compared with a group of age and sex matched control subjects, those with asymptomatic, non-sustained VT displayed no difference in exercise duration, maximal heart rate, or the prevalence of coronary risk factors or exercise induced ischemia as measured by electrocardiography and thallium scintigrahy. Over a mean follow period of 2 years, no subject has developed symptoms of heart disease or experienced syncope or sudden death. Thus, exercise induced VT in apparently healthy subjects occurs almost exclusively in the elderly, is limited to short, asymptomatic runs of 3 to 6 beats usually near peak exercise, and does not portend increased cardiovascular morbidity or mortality rates over a 2 year period of observation. **Conclusion:** Exercise induced VT in apparently healthy subjects occurs almost exclusively in the elderly, is limited to short, asymptomatic runs of 3 to 6 beats usually near peak exercise, and does not show increased cardiovascular morbidity or mortality rates over a 2 year period of observation.

Key Words: Ventricular Tachycardia, Sustained or Non-Sustained, Prevalence, Prognostic Significance.

INTRODUCTION

Frequent or complex patterns of ventricular ectopic activity, whether occurring during routine activity or induced by exercise, are often a marker for serious heart disease and a harbinger of sudden death[1,2,3]. The detection of such arrhythmias is thus an important responsibility of the physician. As with many other markers used in cardiology, the specificity of these ventricular arrhythmias as a predictor of sudden death or even of significant heart disease is far from perfect[3,4,5].

For example, exercise related VT, usually non-sustained, has been reported in several series of apparently normal subjects, including members of the military[4], persons with hyperlipidemia[6], police officers[7,8], and high risk middle aged men[9], as well as patients referred for diagnostic evaluation[10,11,12]. Because of the selection bias inherent in these predominantly young, highly screened populations, these results cannot be directly extrapolated to the community at large, especially the elderly. Given the current physical fitness movement and the accompanying burgeoning of screening exercise tests in apparently healthy persons over a broad age range, it is of practical importance to define the prevalence, associated characteristics and prognostic significance of exercise induced non-sustained VT in a representative population.

PURPOSE OF STUDY

To define the prevalence, associated characteristics and prognostic significance of exercise induced non-sustained VT in a representative population.

MATERIAL AND METHODS

Setting

Nishtar Hospital, Multan.

Sample size

1000 patients.

Duration

Two years.

Study design

Descriptive, analytical study

Sampling Technique

Convenient probability sampling done.

After ECG at rest had been performed, electro-cardiographic tracings were obtained in the sitting position before and after hyperventilation and again upon standing. Subjects then performed maximal graded treadmill exercise until limited by fatigue or dyspnea. A modified Balke protocol was used[13], in which the treadmill grade is increased 3% every 2 minutes, starting from the horizontal position. Men walked at a constant speed of 3.5 mph and women at 3,0 mph. Tests were terminated by the physician because of typical anginal pain, ST-segment depression exceeding 4 mm, hypotension, major arrhythmias, unsteadiness of gait or any untoward symptoms. During exercise and for at least 6 minutes into recovery, electro-cardiographic leads 1, aVF and V_5 were continuously monitored by oscilloscope and an audible heart rate monitor and recorded on FM tape. A complete 12 lead ECG was obtained during the last 15 seconds of each exercise stage and at 2, 4 and 6 minutes after exercise. Suspected arrhythmias, i.e. those heard but not seen, were verified at the termination of monitoring by playback of the tape.

Electrocardiograms at rest and during exercise ECGs were coded according to the Minnesota code criteria[14]. Ventricular tachycardia was defined by the presence of 3 or more consecutive premature ventricular beats at a rate greater than 100 beats/min. An ischemic electro cardiographic response to treadmill exercise was defined by the presence of ST-segment depression of at least 1.0 mm at 0.08 second. In subjects found to have VT associated with treadmill exercise, the following clinical characteristics were examined, number of beats of VT,

other exercise related arrhythmias, exercise duration, maximal heart rate, medications, smoking status and serum cholesterol. In addition, exercise thallium scintigraphy was offered to all subjects with VT who were older than 40 years. Follow up status of these subjects was determined during subsequent visits.

For each subject with VT, 2 age and sex matched control subjects were identified. The prevalence of an ischemic electro-cardiographic response to exercise, abnormal thallium scintigraphic results, cigarette smoking, hypertension and hypercholesterolemia in these 2 groups were compared by Fisher's exact test; the duration of treadmill exercise and maximal heart rate was compared by unpaired 't' test. Continuous data were expressed as mean ± standard deviation. A p value $\leq$ 0.05 was considered significant.

RESULTS

In the study period a total of 1000 participants (625 males, 375 females) underwent a total of 1,465 treadmill exercise tests (971 and 494 tests, respectively). The men were 55 ± 15 years old and the women were 52 ± 16 years old. In this group, VT developed during testing in 13 subjects. Two men and a women with clinical and spirometric evidence of emphysema were excluded from further analysis. Selected characteristics of the remaining 10 subjects are summarized in table-I.

Table-I. Characteristics of subjects with exercise induced non-sustained ventricular tachycardia

Subjects	Age (Yr)	Sex	Maximal heart rate (beats/min)	No. Of beats and time of occur. Of VT	Mean logic pattern of VT	Morphologi c pattern of VT	Other exercise induced arrhythmias	St-segment response	TL-scin	Follow-up duration (year)	Resting ECG
1	69	M	168	3,3; peak	165	LBBB	Occas/. PVC*	±	–	3.8	1° AV block
2	72	M	143	3,6; post†	140	RBBB	Occass. PAC & PVCs*	–	. . .	2.8	Normal
3	65	M	157	4; peaqk	175	P	Rare PACs & PVCs*	+	–	2.1	Normal
4	66	M	173	4; peak	180	RBBB	Occass. PAC & PVC*	–	. . .	2.0	PAC
5	81	M	144	3; peak	180	P	Occass. PAC & PVC‡	–	–	2.9	LAD (-50):RBBS
6	72	M	149	4,hr 140m	167	RBBB	Frequent PVC	–	–	0.8	Occas. PVC:NAST
7	67	F	180	3; hr 118m	260	RBBB	PAC, PVC*	–	–	3.2	Normal
8	28	F	173	3; peak	230	LBBB	None	–	. . .	1.7	Normal
9	68	M	132	3,6; peak§	218	RBBB	5 beats SVT§	–	+	0.7	LAD(-35°)
10	81	F	135	4; immed. Post	180	LBBB	None	–	. . .	0.1	LVH by voltage

VT = Ventricular couplets. *† = 3.5 minutes after exercise at heart rate of 88 beats/min.*
‡ = Also had 18 beats run of supraventricular tachycardia 2 minutes after exercise.
§ = Also had 4 beats run of ventricular tachycardia and 5 beat run of supraventricular tachycardia immediatelyafter exercise
AV = Atrioventricular *ECG = electrocardiogram* *HR = heart rate* *Immed. Immediately*
LAD = left axis deviation *LBBB = left bundle branch block* *LVH = left ventricular hypertrophy*
NAST = non-specific *ST- segment abnormality* *Occas= occasionally* *Occr = occurrence*
P = pleomorphic *PAC = premature atrial contraction* *PVC = premature ventricular contraction*
RBBB= right bundle branch block *SVT = supraventricular tachycardia* *TL Scin = thallium scintigraphy* *VT= ventricular tachycardia*
+ = positive *- = negative+ borderline* *± = borderline* *… = not performed*

The 10 subjects with VT, 7 men and 3 women, represent 1.1% of those tested. Only 1 subject, a 28 year old woman, was younger than 65 years or older, the prevalence of VT was 3.75% whereas in those younger than 65 it was only 0.15%, a 25 fold difference (P <0.0001). The prevalence of VT was hypertensive and 1 was a cigarette smoker. None had serum cholesterol higher than 275 mg/dl. No subject was taking cardioactive medications at the time of testing.

The episodes of VT varied from 3 to 6 beats at rates of 140 to 260 beats/minute. They occurred at peak exercise in 5 subjects, at submaximal effort in 2, after exercise cessation in 2, and both at peak exertion and immediately after exercise in 1 subject; all episodes were asymptomatic. Seven subjects also had isolated premature ventricular contractions (PVCs) during exercise, including 5 with couplets that closely preceded the runs of VT. In each case, the morphologic pattern of the isolated PVCs was identical to that of VT. Four subjects also developed premature atrial contractions with exercise, and 2 had brief bursts of supraventricular tachecardia in the early recovery period after their runs of VT. This ST segment was positive in for ischemia in only 1 subject and was borderline (ST-segment depression between 0.5 and 1.0 mm) in another. Maximal exercise thallium scintigraphy, performed in another laboratory, was negative in these 2 men and was positive overall in 1 of 6 subjects in whom it was performed. VT was not observed during any of these thallium exercise tests. Compared with the age matched control subjects, those with VT displayed no difference in prevalence of cardiac risk factors or the occurrence of an ischemic electrocardiographic or thallium scintigraphic response to exercise. Furthermore, the maximal heart rate (155 $\pm$ 17 vs 151 + 20 beats/minute) and exercise duration (8.6 $\pm$ 3.0 vs 9.3 $\pm$ 4.2 minutes) were similar in the 2 groups. Twenty for hour ambulatory electrocardiography, performed in 5 subjects, all within 1 visit of their exercise related episode of VT, also failed to demonstrate VT in any subject; subject 1 was the only one to show ventricular couplets. Subject 6 was the only one with more than 100 PVCs in 24 hours.

Follow up status showed subsequent maximal treadmill exercise tests were performed in 5 subjects, only 1 of whom (subject 1) had a 3-beat run of VT on repeat testing. Subject 6m had a avid jogger, underwent cardiac-catheterization 10 months after his episode of VT and had normal coronary arteries and normal hemodynamic findings.

DISCUSSION

VT has been documented in association with treadmill exercise in 1 to 20% of apparently healthy subjects with hyperlipidemia or other major coronary risk factors[4,6,7,8,6]. Episodes of VT were usually non-sustained in these relatively young, predominantly male population[4,7,8,9]. Because of the highly selective nature of all of these groups, none of the these studies define the prevalence or characteristics of exercise related VT in an unreferred community based population over a broad age range.

VT induced by treadmill exercise was always asymptomatic and non-sustained and was limited almost exclusively to persons aged 65 years or older. This finding is consistent with the known age related increase in PVC prevalence detected by both exercise testing[4,7,15] and ambulatory monitoring[16,17,18]. The 3.8% prevalence rate of VT in this age group equals the 4% prevalence rate of VT found by 24 hours ambulatory monitoring in a subset of 98 healthy subjects older than 60 years[19]. The asymptomatic maticnature and brief duration of all episodes of exercise related VT also closely mimic the characteristics of VT seen in that study.

The asymptomatic non-sustained runs of VT occurring at or near peak exercise in these apparently healthy older persons appear not to have the same dire prognostic consequences as symptomatic sustained VT occurring in patients with known coronary artery disease. Although our subjects had no symptoms or signs of organic heart disease, the possibility of latent coronary atherosclerosis cannot be dismissed. Autopsy studies have documented a prevalence of coronary disease high as 60% in similarly aged men dying from random causes[20]. In our subjects, the preserved chronotropic and aerobic capacities, absence of anginal symptoms during exercise

testing, and predominantly normal St-segment and thallium scintigraphic responses to maximal exercise would make such a possibility unlikely in the majority.

Perhaps the best evidence for the benign nature of exercise related non-sustained VT in these apparently healthy, predominantly elderly subjects is that all are alive and active at latest follow up, an average of 2 years after detection of VT. No subject has experienced syncope, near syncope or exercise related palpitations. Likewise, none has had a myocardial infarction or angina pectoris. Long-term follow up is needed to confirm the apparently excellent prognosis of these subjects with asymptomatic non-sustained exercise induced VT.

CONCLUSION

Exercise induced VT in apparently healthy subjects occurs almost exclusively in the elderly, is limited to short, asymptomatic runs of 3 to 6 beats usually near peak exercise, and does not show increased cardiovascular morbidity or mortality rates over a 2 year period of observation.

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