Training Related Left Ventricular Hypertrophy in a Soldier

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SUMMARY: A case of physiological Left Ventricular Hypertrophy related to physical training is described and the importance of its distinction from Hypertrophic Cardiomyopathy is discussed.

Introduction

Concentric Left Ventricular Hypertrophy (LVH) is a recognised consequence of sustained endurance training, occurring in approximately 2% of elite international athletes (1). It appears to be a benign condition (2,3) and therefore its recognition and distinction from Hypertrophic Cardiomyopathy (HCM), which may lead to sudden death (4), is important. We report a case of training related LVH in a soldier and discuss the condition and its relevance to the Defence Medical Services.

Case Report

A 32 year old soldier had an electrocardiogram (ECG) performed as part of a screening medical for sport diving. He was asymptomatic, a non-smoker and normotensive. He had a family history of premature Ischaemic Heart Disease in his father and both grandfathers. An echocardiograph performed on his sister was normal. He took part in unit and personal fitness training for 1-2 hours per day, 5 days per week. His physical training consisted predominantly of running and swimming and was not considered excessive within his peer group.

The ECG (Fig 1) showed biphasic t waves in the inferior leads and deep t wave inversion in the lateral chest leads. Echocardiography revealed thickening of the basal Intraventricular Septum (IVS) at 1.47cm (normal range <1.2) and of the Posterior Wall of the Left Ventricle (LVPW) at 1.36cm (<1.1). The chamber dimensions and valves were normal. The ECG changes seemed out of proportion to the echocardiographic findings and the history, raising the possibility of cardiac muscle disease such as HCM.

A period of rest and deconditioning, with repeated ECG and echocardiographic monitoring, was advised. Over a 1 year period his ECG normalised (Fig 2) although the Left Ventricular dimensions on echocardiography improved only slightly. He has now returned to work taking part in exercise on a less vigorous protocol.

Discussion

HCM, in which the cardiac muscle, and particularly the IVS, is hypertrophied, is present in approximately 0.2% of young adults (5) and is an important cause of sudden cardiac death in this age group (4). Physical activity can induce LVH that does not affect left ventricular function (6,7) and prolonged endurance training can cause more profound hypertrophy (1), termed "Athletic Heart". Despite undertaking only a typical exercise programme for a soldier our patient developed significant LVH with dimensions similar to those documented in a small minority of athletes competing at international level in cycling and rowing (8,9). As in this case such physiological hypertrophy can be difficult to distinguish from HCM on the basis of ECG and echocardiography (10).

A grossly abnormal ECG, as demonstrated in our patient, is frequently seen with HCM and has been reported in association with Apical Hypertrophy (11) but rarely accompanies Athletic Heart (12) and whilst it is usual for the LVH in HCM to be asymmetrical, this is not totally reliable (2,13). A family history is not always available and, as with our patient, an exercise history cannot be relied upon. Training effects on the heart have been seen to reverse shortly after the cessation of training (14) and an enforced period of rest and deconditioning is often required to confirm the diagnosis (10).

The prevalence of Athletic Heart within the military population is not known but, given the intensity and type of training undertaken, it is likely to be relatively high. Previously undiagnosed HCM is a recognised, although rare, cause of sudden death in soldiers (15) while physiological hypertrophy appears to have no adverse outcome and may enhance physical performance (3). There is little information on long-term effects. The diagnosis, or exclusion, of HCM therefore has obvious benefits to the individual and the service but its distinction from physiological hypertrophy may entail a prolonged period of restricted activity and a subsequent recommendation to maintain levels of physical activity below those previously undertaken.

Fig 1.

25mm/s Med: Unknown
 10mm/mV 32yr Ht: Ht:
 40Hz Sex: M Race: Cauc NORMAL SINUS RHYTHM
 Pgm 004A Loc: Room: NONSPECIFIC T WAVE ABNORMALITY
 v206 ABNORMAL ECG

Vent. rate. 70 BPM
 PR interval 148 ms
 QRS duration 108 ms
 QT/QTc 384/409 ms
 P-R-T axes 56 53 32

Unconfirmed

Fig 2.

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