Potential Recruits Referred for Cardiac Opinion Review of 100 Consecutive Cases - A Waste of Time or an Investment?

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SUMMARY: Eighty seven of 100 consecutive recruits referred for cardiac assessment of fitness to serve had heart murmurs. Seven of these were rejected as having significant cardiac disease. One with a diagnosis of hypertrophic cardiomyopathy would have been placed at considerable risk had he been exposed to the physical stress of military training. The remaining 6 rejected had conditions which could have been worsened by the stress of military training and/or required intensive cardiac follow-up. These included 3 individuals with aortic regurgitation, 1 with atrial septal defect, 1 with ventricular septal defect combined with a small atrial septal defect and 1 with post rheumatic fever mitral regurgitation.

Thirteen patients we assessed because of other cardiac problems including repaired congenital heart disease and hypertension. The rejection rate in this group was high at 10 out of 13.

The majority of those referred (83/100) were found to be fit for military service. Five of these required advice on antibiotic prophylaxis but the majority had totally unrestricted service.

Although most recruits who present with cardiac "problems" will be fit for service, important and potentially fatal conditions can be detected. Therefore vigilance must be high amongst examining doctors and suspected individuals referred for appropriate assessment.

Introduction

One of the important roles of service physicians is the evaluation of potential officers and recruits with possible medical problems identified at pre-service medicals. This is a substantial user of clinical time and requires expenditure on the provision of hospital resources for such patients at a time when careful analysis of hospital expenditure, both in civilian and military units, is taking place.

Cardiac problems evoke particular public concern. The death of a fit young athlete with hypertrophic cardiomyopathy is likely to achieve national publicity even though such events are rare. This paper analyses 100 consecutive referrals from examining medical officers to the cardiac clinic at the Queen Elizabeth Military Hospital to determine the final outcome and diagnosis of these individuals. It also offers advice on individuals with problems for their future medical officers.

Methods

The notes of 100 consecutive referrals who attended the Queen Elizabeth Military Hospital Cardiac Clinic from January 1993 onwards were reviewed. All were potential recruits, both soldiers and officers, referred by examining medical officers at recruit selection centres. They included recruits for both the regular and territorial army as the medical standards for both are identical.

Recruits were subjected to a full clinical evaluation usually by a consultant, with a chest X-Ray, echocardiogram and electrocardiogram and other specialist investigations as dictated by the condition being assessed.

Results

Ninety-one of the recruits were male and 9 female. The age range was 16-30 although most were 18-21 years of age.

Eighty-seven were referred for an opinion on fitness for service with a murmur discovered at a routine medical and the diagnosis and final outcome of these is detailed in Table 1. Only 7 of these 87 (8%) were found unsuitable for military service. Three had significant aortic regurgitation associated with a bicuspid aortic valve. Individuals were also rejected with an isolated Atrial Septal Defect (ASD), a Ventricular Septal Defect (VSD) combined with a small ASD, hypertrophic cardiomyopathy and mitral regurgitation. The vast majority (74 or 85%) of these murmurs were classified as benign systolic murmurs with 4 others having mitral valve prolapse (MVP), one having a bicuspid aortic valve with neither a gradient across the valve nor regurgitation and one with mild pulmonary stenosis.

Table 2 details the 13 patients referred with cardiac problems other than murmurs. The individuals with sustained hypertension defined by JSP346 (1) as a resting systolic blood pressure above 140 mmHg and for a

Table 1
Diagnosis and Final Outcome for Individuals with Murmurs

Diagnosis	Accepted	Rejected	Total
Benign Systolic Murmur	74	—	74
Bicuspid Aortic Valve	1	3	4
Mitral Valve Prolapse	4	—	4
Pulmonary Stenosis	1	—	1
ASD	—	1	1
VSD and Small ASD	—	1	1
Hypertrophic Cardiomyopathy	—	1	1
Mitral Regurgitation	—	1	1
Total	80	7	87

diastolic blood pressure (phase 5) greater than 90 mmHg were rejected and referred to their own doctor. In 3 cases monitoring of blood pressure had taken place in hospital. One individual has his enlistment deferred due to a recent mild myocarditis with T wave changes on an ECG at the time of review and a further one refused due to a recent severe myocarditis requiring the ongoing use of ACE inhibitors. A further individual was suspected to have dextrocardia at his initial medical when an apex could not be found and heart sounds were noted to be indistinct but at hospital examination he proved to be normal. Four individuals were referred having had previous cardiac surgery. One had had an ASD successfully repaired and was accepted. Recruits with a corrected transposition of the great arteries, a repaired Fallot's and an AV Canal combined with mitral valve repair were rejected.

Five of the total of 83 patients accepted 5 were advised about antibiotic prophylaxis before relevant procedures (4 MVP and one bicuspid aortic valve).

Table 2
Diagnosis and Final Outcome for Individuals referred with Specific Cardiac Problems

Diagnosis	Accepted	Rejected	Total
Hypertension - labile	1	—	1
Hypertension - sustained	—	3	3
Repaired Congenital Heart Disease	1	3	4
Pericarditis with Atypical Pain	—	1	1
Recent Myocarditis	—	2*	2
Hypercholesterolaemia	—	1	1
Possible Dextrocardia	1	—	1
Total	3	10	13

*1 Myocarditis deferred and reassessed - later accepted

Discussion

The majority of recruits referred with heart murmurs have benign systolic murmurs and are fit for enlistment in

the normal medical grade without restriction. They are declared to be benign systolic murmurs if an ejection systolic murmur is found and both electrocardiogram (ECG) and echocardiogram (ECHO) are normal, showing no evidence of valvular pathology, normal chamber size and normal valvular function.

However, not all ejection systolic murmurs are totally benign. This series has 1 hypertrophic cardiomyopathy, ASD, 1 pulmonary stenosis and 1 bicuspid aortic valve without regurgitation. Four individuals with ejection systolic murmurs also had echocardiographic mitral valve prolapse.

Hypertrophic cardiomyopathy is rare with a prevalence of around 20 per 100,000(2). In its non obstructive form it may present only as a soft systolic murmur without any of its more classical signs such as a jerky pulse. The risk of sudden death, which may occur without prior symptoms (3-6) makes these individuals unacceptable for the rigours of military training. Cases of death related to physical exercise in the Services with this condition have previously been reported (7).

Mitral Valve Prolapse (MVP) may have a midsystolic click with or without a systolic murmur or be pure echocardiographic phenomenon. It has been suggested that MVP is associated with atypical chest pain and significant complications (8) but this has not been proved with population based studies and it is now generally accepted as a relatively benign condition (9-11).

A small number of patients do develop severe mitral regurgitation, but considering that MVP has an incidence of about 2% in the male general population as assessed in the Framingham study (12) this risk is low. Although mitral valve prolapse is a risk factor for endocarditis (13, 14) it is probably not a significant risk in the absence of abnormal auscultatory signs other than a mid-systolic click (15).

As prolapse becomes more severe antibiotic prophylaxis should be recommended and therefore individuals with evidence of regurgitation plus prolapse are advised antibiotic prophylaxis.

A 40% incidence of MVP has been reported in young individuals with ischaemic stroke (16), however other studies have shown no increase in incidence in control groups over the general population (17-19).

Serious arrhythmias such as ventricular tachycardia and even ventricular fibrillation leading to sudden death have been reported in association with MVP (20,21) although the significance of MVP *per se* has been debated and it is suggested in a case control study that the mitral regurgitation is the important feature (22). Nevertheless the development of symptoms suggestive of a dysrhythmia in a subject with MVP should prompt further investigation.

Individuals with MVP are therefore accepted in the normal grade with advice on antibiotic prophylaxis appropriate but in the unlikely event of the development of a pansystolic murmur suggesting significant regurgitation or symptoms of a dysrhythmia, further cardiological advice should be sought.

Four patients were identified with bicuspid aortic valves. This is relatively common abnormally occurs in 1-2% of the population (23). It has been predicted that one-third will have normal function throughout life, whilst the remainder will develop some degree of either stenosis or incompetence, singly or in combination (24). With the risk of bacterial endocarditis (23,24) the one individual accepted with this condition will clearly need antibiotic prophylaxis before dental and other relevant procedure as well as intermittent checks to ensure he remains well. The development of a diastolic murmur or cardiac symptoms should prompt early review. Two of the three individuals rejected have pure aortic regurgitation and other mixed stenosis and regurgitation. All were referred back to their general practitioners for further assessment and one, at the age of 17, is already developing ventricular dilatation heralding the need for close observation and consideration for valve replacement.

The risk of syncope and sudden death with aortic stenosis is well recognised although most will have been previously symptomatic (25,26).

The individuals with an isolated ASD and a VSD combined with a small ASD were rejected and referred back to their own doctors for further assessment. The recruit with significant mitral regurgitation had a past history of rheumatic fever and was rejected and referred back to his local hospital for follow-up. The recruit with mild pulmonary stenosis had normal right and left ventricular heart function and was at low overall risk and therefore accepted.

In terms of the individuals referred for murmurs the majority had benign systolic murmurs. At the time of assessment left ventricular function and valves were normal. These individuals need no specific follow-up. The presence of a benign murmur on enlistment does not however mean they will never have a significant murmur. It has to be accepted that at present some 12% of patients with aortic stenosis have a calcified tricuspid aortic valve and with the declining incidence of rheumatic fever this percentage is likely to increase (27). A change in cardiac signs such as the development of cardiomegaly, a change in pulse character or pressure, a thrill or change in character of the murmur should lead the doctor to reassess the individual; a benign murmur of 'x' years ago may no longer be benign!

Whilst ejection systolic murmurs are usually benign, pansystolic murmurs and diastolic murmurs are not and at any stage in a career require a careful search for underlying disease. They will almost always need some active follow up and possible future intervention even if only antibiotic prophylaxis. The underlying conditions however usually preclude military recruit entry.

The recruits referred with ongoing cardiac problems are an interesting sub group. Whilst some arrive expecting to be refused others have canvassed support from their own cardiologist. Letters pointing out that an individual is fit to join the army for sedentary duties or with continuing medication are not unusual. These individuals have a much higher refusal rate - 10 out of 13 (77%). The

reasons for rejection of frankly hypertensive individuals those with ongoing cardiac medication and continuing symptoms are obvious. One individual had had a recent episode of myocarditis associated with influenza. His ECG revealed ongoing T wave changes. Although he was asymptomatic at review and had normal cardiac function he was deferred until full ECG recovery.

The recruit with hypercholesterolaemia had cholesterol of 6.3 mmol/l on a low fat diet. It would have proven difficult for him to maintain his low fat diet particularly in his early years of military service when he would have spent a significant amount of time on military exercises. It was therefore not in his best interests to serve.

The sub group with previous cardiac surgery are often more difficult. Whilst a corrected ASD had a good long term prognosis the more extensive operations are still at a relatively early stage, with follow up only existing for short to middle term. There is an increased risk of rhythm disturbances in many of these subjects and others have evidence of significant ongoing haemodynamic impairment. This is demonstrated in a review of 62 patients with Fallot's (28). Each of these subjects therefore has to be assessed on its own merit with full knowledge of previous surgery, ongoing problems and prognosis.

In 1990 a review of potential recruits reported that 4 of 92 with a murmur were rejected whilst commenting that 28% of subjects with asthma also had murmurs (29). It was also suggested that because few individuals are discharged with rheumatic or congenital heart disease it is unlikely that significant numbers with disease are being allowed into the service and hospital referral therefore seems unnecessary for most young people who have heart murmurs. Whilst our study confirms that most murmurs are benign systolic murmurs it does demonstrate that some are not and need either advice and follow up or rejection to ensure safety for the individual. It is also important to accept that most individuals with valvular heart disease would not normally be medically discharged as they would be fit for service in a downgraded capacity.

Cost is more difficult to quantify. Although travel expenses are a real figure it is more difficult to cost consultants' and technicians' time and capital equipment. A figure of £300 or more would not be unreasonable for the private sector to provide an opinion on a murmur with an electrocardiogram, an echocardiogram and a chest X-ray. In the public sector these services are already in place and therefore the capital and true costs are considerably less.

For murmurs, where the rejection rate is low, it may seem appropriate to avoid these costs by automatic acceptance without further opinion. We have, however, demonstrated that we would miss significant clinical problems. Great vigilance by examining doctors may detect an aortic regurgitant murmur in addition to a systolic murmur but would not detect hypertrophic cardiomyopathy or simple bicuspid valve.

The group with previously diagnosed cardiac problems or other than simple murmurs have a high rejection rate. The least costly option would be to reject these individuals without further opinion. Some do have letters of support from civilian consultants and it would be rather difficult for the examining doctor to reject these without specialist opinion. The fact that some are accepted justifies the expense of reviewing these cases.

Lost recruit places and time away from work due to medical problems are also costs to be considered. Training a soldier is not cheap and to have his training wasted or his career shortened by initial inadequate assessment is not acceptable.

Finally in today's medicolegally conscious society can we ignore a murmur without appropriate assessment?

Conclusion

Whilst the majority of recruits referred with murmurs have benign systolic murmurs their formal assessment is essential to exclude more significant reasons, which may not be evident on a simple medical examination, and to avoid placing potential recruits at undue risk during training and later service. Other more complex cardiac problems need a formal assessment to enable a balanced decision to be made on a recruit's fitness for service based on knowledge of previous surgery, current status and prognosis. Any attempts to avoid this assessment may result in individuals being subjected to potentially dangerous or damaging workloads.

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