

Complications of Coronary Artery Disease among Military Personnel During Military Deployment Overseas Resulting in Death: Lesson Learned from Two Cases

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ABSTRACT:

Health screening is compulsory to all military personnel in Malaysia before deployment for peacekeeping missions overseas. However, there have been deaths reported due to complications of coronary artery disease during deployment. These deaths which can be prevented cause great loss to the organization and unnecessary grief to the families, including heavy financial implications to the stakeholder. We would like to report two cases of deaths due to complications of coronary artery disease among military officers during their deployment in peacekeeping missions overseas. We highlighted these cases to explore the risk factors of coronary artery disease, which could be risk-indicators to prevent overseas deployment of at-risk military personnel in the future. We also recommend some improvements to medical screening procedures, to prevent unnecessary deaths during peacekeeping missions overseas.

KEYWORDS: Military Personnel, Military Officer, Medical Screening, Coronary Artery Disease, Peace Keeping Mission

INTRODUCTION

Coronary artery disease is the most common cause of deaths in Malaysia¹. The Malaysian burden of disease study conducted in 2000 found coronary artery disease to be the biggest cause of death with a total of 22,158 deaths or about one-fifth of all deaths¹. Mortality due to coronary artery disease keeps increasing in trend worldwide in developed and developing countries in both civilian¹ and military populations². A technical report by Farid³ showed that deaths due to coronary artery disease are increasing among army personnel in Malaysia from 18.1% in 2015 to 23.2% in 2016. The report also stated that coronary artery disease occurred as early as mid-30 years-old among army personnel in Malaysia.

Military personnel are exposed to a variety of hazards to health which can lead to morbidity and mortality during their services. Each military personnel must be physically and mentally fit to ensure they can perform their military duties efficiently. The Malaysian Armed Forces implements stringent medical screening based on current medical guidelines^{4,5} to assess the health status among its military personnel for early detection of infectious and lifestyle diseases. Military personnel are required to do comprehensive medical screening which includes a full physical examination of various body systems, as well as basic radiological imaging and laboratory investigations. Military officers aged 40 years old and above are required to do more specific investigations, including cardiovascular risk assessment such as fasting lipid profile, electrocardiogram and stress test ECG if indicated. Those who have single or multiple medical conditions detected during screening are treated accordingly and subjected to the medical board or may leave the service earlier due to medical reasons. Military personnel selected for peacekeeping mission overseas under the United Nations are required to do a more stringent medical screening following the United Nations Health Standard requirements. These military personnel who have medical conditions are not allowed to participate in any peacekeeping mission overseas.

It has been reported that there were four deaths of officers (military officers) (21.0%) out of 19 deaths among military personnel in Malaysia from 1961 to 2013 during the United Nations Peace Keeping mission overseas⁶. The causes of deaths were due to combat casualties, military vehicle accidents, complications of hazardous infectious diseases and coronary artery diseases. We would like to present two cases of deaths due to complications of coronary artery disease among military officers during their deployment under peacekeeping missions. The objective of this paper is to determine the possible risk factors which could have been indicators to prevent overseas deployment in the future and to recommend some improvements in medical screening on cardiovascular assessment in a military setting to avoid unnecessary deaths before peacekeeping deployment missions.

CASE PRESENTATION

Case 1

The late senior air force male officer, Malay, aged 50 years old, was an observer in the United Nations mission as a terminal officer in the Republic of Congo, Africa. The duration of his deployment was for one year and he was expected to complete his duty in May 2009.

He was brought in dead while on duty at Level 1 Clinic on the 30th of April 2009 at 6 pm. Post mortem reported that death was due to acute heart failure secondary to coronary artery disease. Internal examination of the heart revealed that the abdominal aorta had infiltrations of atheromatous plaques with ulceration in some of them. Both left and right coronary arteries were infiltrated by atheromatous plaques. The diameter of the proximal portion of the left coronary arteries was severely compromised. The wall thickness, valves and pericardium were normal. The respiratory system showed both lungs were edematous and congested.

He underwent a Standard United Nations entry medical examination on the 28th of March 2008 at a military hospital and was declared healthy and fit for United Nations mission overseas. Physical examination revealed that his body mass index (BMI) was within the normal range (20.95 kg/m²), with normal blood pressure (BP). An electrocardiogram showed sinus rhythm and no ischemic changes were seen. Exercise stress ECG was also negative for ischemia. Laboratory investigations found that his fasting cholesterol and LDL were high (6.4 mmol/l and 5.1 mmol/l respectively). His fasting blood sugar (FBS) was normal (5.3 mmol/l).

He was in the service for 15 years and was a heavy and chronic smoker (smoked 20 cigarettes sticks/day for the past 35 years). His father had hypertension and died due to heart complication. Other family members were healthy. A review of his previous medical records showed that he had a high level of blood cholesterol detected during annual medical check-ups in 2003 and 2005. There was no record to show whether he was on anti-cholesterol medications during that time.

Case 2

This late senior army male officer, Malay, aged 42 years old, was a staff officer in the United Nations mission in Lebanon since November 2011. He complained of epigastric pain for three days and reported sick at the Level II Military Hospital in Lebanon on the 6th of February 2012 at 9 am. He suddenly collapsed while waiting for medical treatment. He was resuscitated for multiple cardio-respiratory arrests. Due to his unstable and critical situation, he was transferred to a government hospital nearby at around 1 pm. During the transfer, he had multiple cardiac arrests in the ambulance and the emergency room, before being transferred to the cardiac care unit at around 2.30 pm. However, he passed away at 4 pm on the same day due to cardiogenic shock with evidence of myocardium infarction, severe acidosis and acute renal failure.

The post mortem revealed that the heart was enlarged (right ventricle and atrium) with a hypertrophied left ventricle. A whitish-grey area was noticed on the anterolateral aspect of the left ventricle. The left main coronary artery and left anterior descending artery showed the presence of atherosclerotic plaque, calcifications and ulcerated plaques with mild clotting. The right and left lungs were congested and edematous. He underwent a Standard United Nations Entry Medical Examination on the 14th of September 2011 at a military hospital and was found to be healthy and fit for a peacekeeping mission overseas. He was overweight (26.50 kg/m²) with a blood pressure of 128/88mmHg and had a regular pulse at 68 beats/minutes. The resting echocardiogram (ECG) showed sinus rhythm with intra-ventricular conduction defect, however, exercise stress ECG was negative for ischemia. Laboratory investigations found that his fasting serum cholesterol and LDL were high (6.6 mmol/l and 5.1 mmol/l). His fasting blood sugar was normal (5.3 mmol/l). Liver function test revealed raised Alanine Transaminase (ALT): 64 IU/L, Alanine Phosphatase (ALP): 128 IU/L and GGT 118 IU/L. He was already on anti-lipid medication.

He was in the service for 15 years and was a chronic smoker and smoked 10 cigarettes a day for the past 18 years before his death. He was also found to have dyslipidemia detected in 2010 during an annual medical check-up. There was no family history of death from heart complications, neither was there any family history of heart disease.

DISCUSSION

Both officers died due to complications of coronary artery disease based on post-mortem findings that showed both cases had atheromatous plaques in the main coronary arteries. The sudden death in Case 1 could have been due to a blocked peripheral coronary artery which led to myocardium infarction and dysfunctional heart as evidence of congested, heavy and cyanosed lungs.

Epidemiologically, both deceased were males, Malay and less than 55 years old. Coronary artery disease affects men more than women¹. These findings are consistent with the data reported by Muda et al, where 55% out of 165 patients with coronary artery diseases had premature deaths and the men were less than 55 years old and had a positive family history of heart disease and low HDL level¹. Another study by Zuhdi et al reported out of 1595 patients, 16% were categorized into the young coronary artery disease group (less than 45 years old for men and less than 55 years old for women) and were significantly associated with more active smoking and obesity compared to the older group⁸.

There was also a significant genetic contribution in Case 1. A study by Chu *et al*⁹ was conducted to determine the relationship between genetic contribution and the risk of coronary disease. The study found a significant difference in the coronary artery disease-related genetic contribution in the Malay and Indian ethnic groups, but not in the Chinese.

The high prevalence of coronary artery diseases is related to hypertension, diabetes mellitus, dyslipidemia, smoking and obesity as reported in the NCVD database registry¹⁰. In both cases reported here, there were significant risk factors such as smoking and hypercholesterolemia. These findings are supported by a few local studies^{11, 12, 13} which found that smoking and hypercholesterolemia were significant predictors of coronary artery disease. A study from Shamsul Bahari Muhammad recorded 75.5% out of 392 personnel were active smokers in an army camp in Malaysia¹⁴. Both cases here also recorded significantly higher results of serum cholesterol and LDL. As a result of this, a standard cut-off point for serum cholesterol at 5.2 mmol/l and 2.6 mmol/l for LDL has been set for military personnel in Malaysia for overseas deployment and implemented since 2016¹⁶.

The diastolic blood pressure was slightly increased in Case 2 who was also overweight, and an intraventricular conduction defect was also recorded during medical screening. Statin was started in Case 2, but there was no documentation of an anti-cholesterol medication in Case 1.

In addition to that, serving in overseas missions for a long period, working in a military environment and being away from their families could have resulted in depression which may have exacerbated their conditions. In a study conducted by Michael et al in a group of acute coronary syndrome patients, those with depression were ten times more likely to have a recurrence of cardiac events¹⁶.

By using the current Framingham Risk Score¹⁷, both deceased scored 11% for the estimation of 10-year cardiovascular diseases which falls under the moderate-risk category. However, the risk score per se does not translate to better patient outcomes unless they are used appropriately by a physician and the communicated risks are well understood by the patients. The scores for Case 1 and Case 2 were 24.0% and 28.0%, respectively based on the Duke Clinical Score 18. As for the Diamond and Forrester Model¹⁹, the scores were 20.0% and 13.0%, respectively which fall under the intermediate-risk category for coronary artery disease which justifies the use of exercise stress ECG as a form of screening for cardiovascular fitness.

The fact that both deceased were screened negative for exercise stress ECG showed that both were cardiovascular fit for the deployment. Both were asymptomatic of angina before the screening and had a moderate-risk factor for cardiovascular disease. Exercise stress ECG has sensitivities between 45%-50% and specificities of 85% – 90% if all biases are avoided. The use of exercise Stress ECG in an asymptomatic patient with a low pre-test probability of coronary artery disease will lead to a high incidence of inconclusive or false-positive results with the need for further test. On the contrary, a high-risk patient with a negative test will lead to a false-negative result which could cause a possible dangerous implication.

Among the profound risk factors in both cases was smoking. Smoking contributes significantly to cardiovascular disease. A case-control study in 52 nations, concluded that smoking increased the risk of CVD by nearly 3-fold with other confounding factors controlled²¹. The same study demonstrated that the risk for cardiovascular disease reduced to less than 2-fold after 3 years of smoking cessation. However, the risk continues to increase by 20% even after 20 years of stop smoking. The strong contribution of smoking towards cardiovascular disease was further supported by a meta-analysis of twelve prospective studies looking into the relationship between smoking and sudden cardiac death²². The meta-analysis revealed that the relative risk of sudden cardiac death for current smokers was 3.1 and 1.4 for former smokers in comparison to those who never smoke. In addition to that, smokers have higher levels of cholesterol in the blood²².

CONCLUSIONS AND RECOMMENDATIONS

The current coronary artery disease health screening that is being conducted in military medical institutions, where clinical history is properly documented including a health risk assessment, supported by laboratory-related tests and cardiovascular fitness tests (exercise stress ECG) are generally adequate in determining cardiovascular fitness among military personnel before allowing them for overseas military deployment. The usage of a scoring system in estimating a coronary heart disease risk (such as Framingham Risk Score) is useful in projecting the personnel's progress and performance when preventive cardiology is a goal especially in targeting the blood pressure, blood sugar level or their lipid profile. With these in mind, a framework of intervention can be discussed further with the personnel and an improvement of risk profiles will lead to a better outcome into a fit and healthy military community.

Another recommendation is to introduce the usage of periodic electrocardiogram (ECG) in military medical institutions as it is the most readily available and immediate tool to diagnose acute coronary syndrome and myocardium infarction. However, it is important to note that the sensitivity and specificity of the initial ECG changes are only 54.5% and 70.8% respectively, and the results should be interpreted cautiously with other clinical and laboratory findings²⁰.

Each military personnel in the service must be aware of their health and undergo periodic health screening as their occupation requires them to be medically and physically fit and able to be deployed for emergencies or conflicts locally or overseas. Military commanders must play vital roles in ensuring that their military personnel under their command are physically and mentally fit by introducing health awareness into their military settings. Health promotion and clinical intervention programs among military personnel must be aggressively conducted to reduce the risk of coronary artery diseases such as healthy lifestyle and good

nutrition as well as body weight and fitness management. No smoking campaigns, mental health awareness programmes and the obligation to do medical screening regularly should be continued and enforced.

Military health professionals should update their clinical knowledge and skills to ensure best practices during medical examinations to avoid any preventable deaths during an overseas military mission. The military health services have to improve and enhance the capability in detecting non-communicable diseases, specifically coronary artery disease, and to expand their infrastructure in detecting and managing cardiology cases in all military clinics and hospitals, as well.

Most importantly, the determination to prevent cardiovascular mishap during deployment should come from policy makers and leaders in the military. With compelling scientific and clinical evidences available in current days and age, it is time to consider that servicemen who smoke and use tobacco to be unfit for overseas deployment.

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