Post-Traumatic Stress Disorder and Coronary Heart Disease*

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Post-traumatic stress disorder (PTSD) is a mental health condition that occurs relatively commonly in people exposed to situations that cause severe psychological stress, such as natural disasters, combat, or physical attack. In this issue of the Journal, Vaccarino et al. (1) report that the incidence of coronary heart disease (CHD) was more than double in twins from the Vietnam Era Twin (VET) Registry who had PTSD compared with those without PTSD. Moreover, they showed that PTSD was associated with significantly lower myocardial perfusion and coronary flow reserve as assessed by positron emission tomography.

This study adds to the growing body of studies performed in a variety of populations that show an association between PTSD and clinical CHD. Some of these studies show a dose relationship between the number of PTSD symptoms and CHD (2,3). In addition, Ahmadi et al. showed that PTSD was strongly associated with the presence and severity of coronary artery calcification, a measure of subclinical atherosclerosis (4).

What underlies this relationship? PTSD is associated with higher rates of cigarette smoking (5); may be associated with other traditional cardiovascular disease risk factors including hypertension, dyslipidemia, and diabetes (6); and is also associated with newer risk factors such as biomarkers of inflammation (7). Autonomic nervous system dysregulation is also associated with PTSD, which can result in reduced heart rate variability and increased QT variability (8), both of which are predictors of adverse cardiovascular outcomes.

Therefore, we have a great deal of data to support PTSD as a risk factor for CHD and a number of potential mechanisms through which this risk is manifested. Indeed, in a recent editorial by Morabia and Costanza, commenting on results from the World Trade Center (WTC) Health Registry study, stated that "the long-term follow-up of the World Trade Center disaster victims and responders provides an opportunity to quantify how...post traumatic stress disorders may need to be factored into the FHS risk score" (9). This editorial addressed a study in which PTSD was associated with a 62% increased risk of heart disease in men and a 68% increase in women (3). However, much like the study by Vaccarino et al. (1), the baseline cardiovascular risk factors (hypertension, diabetes) and study endpoints (angina, heart attack, or any other heart condition) were assessed by self-report of a physician diagnosis, and dyslipidemia/lipids was not included as a risk factor. Actual measurement of the risk factors and validation of study endpoints were not performed. This methodology inevitably affects the precision of risk estimates because of the imprecision of the risk factor and outcomes assessment. The general issue is that many of the studies examining the PTSD-CHD relationship have done so with less than optimal self-reported risk factor data and with CHD endpoints that were not validated, although exceptions do exist (10).

Other considerations in examining the association of PTSD with CHD and in designing future studies addressing this relationship include diagnostic criteria for PTSD, duration and timing of exposure to PTSD, psychiatric comorbidity, and pharmacological treatment. The diagnostic criteria for PTSD have not been standardized across studies. For example, 2 of the studies noted in this editorial used the National Institute of Mental Health Diagnostic Interview Schedule (1,2), while 3 of the studies used other validated scales (3,4,10). It is common for studies to use different measures in the assessment of exposure and is not necessarily problematic but may contribute to some variability in results.

The impact of the duration and clinical course of PTSD and the potential for pre-existing PTSD at the time of assessment are other important study design issues. There are differing trajectories of PTSD symptomatology that ideally should be taken into account in assessing the risk of CHD associated with PTSD, ranging from persistence of high levels of symptomatology to complete resolution (11). Because of this, the risk association of PTSD with CHD is likely to be heterogeneous and partially dependent on the trajectory.

In regard to the potential for pre-existing PTSD, studies of PTSD and CHD risk are often performed to assess for the presence of PTSD after an exposure that is associated with PTSD, such as natural (e.g., earthquakes) or man-made (e.g., terrorist attacks) disasters. Subjects from the populations that are studied may have prior pre-existing PTSD resulting from early exposure (e.g., exposure to assaultive violence or death of a loved one). In these instances, the onset of PTSD will predate the study assessment and might affect the risk assessment because of the duration of the disorder and the symptoms.
Psychiatric comorbidities are frequently present in patients with PTSD. For example, in the study by Vaccarino et al. (1), major depression was present in 38% of study participants with PTSD versus 19% without PTSD. Depression is an established risk factor for CHD, but adjustment for depression does not generally have a significant impact on the risk estimates for PTSD. PTSD may be associated with other psychotic disorders such as schizophrenia that are not generally considered in these analyses (12) and which themselves may be associated with an increased risk of CHD (13). Moreover, some antipsychotic medications are associated with an increased risk of CHD (14).

Overall, there are considerable data supporting an association that is likely causal between PTSD and CHD outcomes. Although the studies often use self-reported data with risk factor measurement and self-reported outcomes without validation, the strong associations with subclinical outcomes (1,4), the studies that show a dose relationship, and the evidence for plausible mechanistic associations suggest that the relation is real and clinically important.

Because of the noted limitations of this and other studies, calculation of a Framingham-type risk score including PTSD for clinical CHD outcomes does not seem advisable at this time. However, for the primary care physician or cardiologist, the available data suggest a practical, common-sense approach to the management of cardiovascular risk in a patient who is at risk for or has a diagnosis of PTSD. A patient who is at risk for PTSD (e.g., exposure to domestic violence, assaultive violence, death of a loved one) should be screened and a diagnosis should be obtained. If PTSD is diagnosed, the patient should be treated by a clinician who has expertise in the management of PTSD. The primary care physician or cardiologist should manage more traditional risk factors (hyperlipidemia, hypertension, diabetes) with lifestyle modification and medication as appropriate and should maintain awareness of the PTSD treatment plan, particularly if it includes medications that may have an effect on the occurrence of clinical cardiovascular events.

In conclusion, the study by Vaccarino et al. (1) and other available data support an association between PTSD and coronary disease that may be causal. The study by Vaccarino et al. (1) is particularly important because of the powerful association of PTSD with impaired myocardial coronary perfusion assessed by positron emission tomography imaging. Our consciousness should be raised to the importance of obtaining a history of exposures that are associated with risk of PTSD and to perform or refer patients for screening, diagnosis, and treatment when appropriate.

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