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Review article

Depression and cardiovascular disease in elderly: Current understanding

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ABSTRACT

Geriatric depression is a major public health problem and has an especially large effect on health when comorbid with a chronic medical condition. Hypertension, coronary heart disease, and diabetes are accompanied by a high incidence of depression and can affect the treatment and prognosis. Depression is a highly prevalent risk factor for incident of and is associated with morbidity and mortality of cardiovascular disease. In addition to the proactive and effective control of primary diseases, efforts should also be made to improve patients' psychological and social function. Current evidence on antidepressive therapy in patients with coronary diseases is limited. A better understanding of pathophysiological mechanisms underpinning depression and cardiovascular disease as well as the complex biological crosstalk of cardiovascular disease complicated with depression is particularly important for future therapeutic strategies. The following review is on current understanding of geriatric depression and cardiovascular disease.

1. Introduction

As the number of old people throughout the world increases, senescence-related issues become increasingly important. A major current challenge is maintaining mobility and quality of life into old age. Hypertension, coronary heart disease, diabetes and other cardiovascular diseases (CVD) are psychosomatic diseases, and psychological factors play an important role in the occurrence and development [1–3]. Geriatric depression is a major public health problem and has an especially large effect on health when comorbid with a chronic medical condition [4,5]. With the rapid aging of the population, the prevalence rate of geriatric depression increases fast. The prevalence rate of depression is up to 50% in patients with chronic disease [6]. Depression leads to a variety of functional somatic disorders, and seriously affects the attitude of treatment in patients with diseases, so that reduce the quality of life [7]. Depressive frequently occurs due to comorbid medical conditions such as thyroid disease, diabetes, cardiac disease, and other chronic medical conditions [8–11], and can predict CVD and all-cause mortality independently of a wide range of potential confounders [11]. But at present, most patients with geriatric depression are clinically undiagnosed and lack sufficient support from their family members and the community. As two of the most leading causes of death and disability, however, little is known regarding the link between the geriatric depression and CVD as well as the secondary prevention. A few clinical trials focusing on the prevention of depression were found to decrease the risk of cardiac events, while further clinical trials are needed to test well-defined mental health interventions [1,12]. Therefore, a better understanding of comorbid CVDs and depression is particularly important for improving CVD management in older adults and thus achieving a healthy aging of society.

2. Epidemiology

Depression is a mood disorder characterized by listlessness and slow thinking, which can be accompanied by psychomotor retardation symptoms including a loss of interest in normal activities. Along with aging, the physiological and psychological functions of older adults become weakened; in particular, the sensory organs and nervous system involved in psychological activities can experience degenerative changes. The metabolism of the nervous system and changes in some neurotransmitters are the pathophysiological basis of geriatric depression. In addition, the changes in social roles, social environment, and family circumstances, as well as life events such as somatic illness and death of a spouse, can render older adults more susceptible to geriatric depression. Because of differences in screening tools and survey

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samples, the prevalence of depression dramatically differs worldwide [13–15], for example, community-based studies in older adults have shown that the prevalence of depression was 33.5% in Japan but 17.6% and 14.6%–17.2% in the United Kingdom and the United States, respectively [13–15].

The prevalence of depression is 15–20% in CVD [16,17]. Major depression was present in 19.8% in patients with acute myocardial infarction, and 31.1% of these patients with previous myocardial infarction had clinically significant depression [18]. The prevalence of depression in hypertensive patients was 40.1% [19]. According to Bensenor et al., the incidence of depression was as high as 63.4% in hypertensive women and 36.6% in hypertensive men [20]. The incidence of depression increases remarkably in hypertensive patients. Using the general Quality of Life Scale, Jonas et al. found that depression symptoms were associated with an increased incidence of hypertension [21]. Depression not only is a contributor to hypertension but also may affect the outcomes and prognosis of hypertension and the efficacy of drugs.

3. Relationship between CVDs and depression in the elderly

Chronic diseases such as CVDs can affect older people's self-rated health and cognitive functions and thus cause somatic dysfunction, which can trigger and exacerbate the occurrence and development of geriatric depression. Also, depression can induce or worsen chronic diseases and affect prognosis. A large (60% to 80%) increased the risk of coronary heart disease was found to be associated with depression [2]. CVDs have a long disease course and require long-term medications, during which persistent complications, decline in physical functions, heavy financial burden, and increased dependence on other people will remarkably increase depression symptoms in older adults [22]. However, research has also suggested that hypertension and diabetes are not associated with an increased risk of depression [23].

3.1. Depression and hypertension

Depression was associated with hypertension [24]. A meta-analysis found that depression increased the risk of hypertension incidence, furthermore, the risk was significantly correlated with the prevalence of depression at baseline [25]. Clinical and epidemiological studies have shown that the presence of depression and its severity were closely related to the prognosis of hypertensive patients. The morbidity and mortality rates of myocardial infarction, stroke, sudden death, and other severe cardiovascular events increase in patients with depression [26,27]. Adamis et al. found that the incidence of hypertension increased in patients with depression, and the depressive mood was associated with increased blood pressure levels [28]. However, some other studies did not find any link between depression and high blood pressure [29]. Insufficient recognition of different pathways linking depressive symptoms with blood pressure, hypertension and related medications may lead to the disparity [30].

3.2. Depression and coronary heart disease

In healthy populations, depression increases the risk of coronary artery disease by 1.5–2.0 times; in patients with coronary artery disease, depression increases the risk of myocardial infarction by 1.5–4.5 times [31–33]. Depression is associated with a higher incidence of coronary heart disease [34], and a greater number of recent stressful life events elevate the risk of new-onset CVD [15]. Furthermore, psychometric evaluation of depression is related to the frequency of chest pain in patients with or without coronary artery disease in a prospective cohort study [35]. Recently, some global studies have found that positive emotions can reduce the 10-year incidence of coronary heart disease [36]. A study in the United States found that low blood pressure was associated with high scores of positive emotions [37].

3.3. Depression and diabetes

The incidence of depression has been reported to reach 8.5–27.3% in diabetic patients [38,39]. A prospective study has indicated that diabetes increased the risk of depression by 1 time; further analysis showed that psychological disorders and diabetes may exacerbate each other. Depression can inhibit the secretion of pancreatic islet cells, thus reducing the glucose metabolism-regulating capability in diabetic patients [40], thus leading to a high mortality risk [41].

3.4. The clinical screening tool for geriatric depression

Most studies have confirmed the positive relationship between CVDs and depression. However, comparison among these studies is often difficult because of the following reasons: lack of uniform/standardized screening tools; lack of nationwide large-scale surveys; some studies were based on self-rated hypertension; lack of systematic adjustment of the underlying confounding factors; and lack of standardized diagnostic criteria for mental disorders [42]. Currently, no internationally recognized screening tool has been available for assessing depression. The commonly used clinical scales for screening for early geriatric depression include the Geriatric Depression Scale (GDS), Center for Epidemiologic Studies Depression Scale (CES-D), and Beck Depression Inventory (BDI). The GDS is mainly designed for older adult populations, whereas the CES-D is more suitable for large-scale epidemiological surveys across a range of age groups. A recent study found that CES-D in useful to screen for both depression and anxiety disorders in patients with coronary heart disease [43]. In addition, the Hamilton Rating Scale for Depression, Self-Rating Depression Scale, and Depression Questionnaires are often used for clinical diagnosis and assessment [44].

4. Potential mechanisms governing the impact of depression on CVDs

The impact of depression on CVDs in older adults may be related to the following four factors: impaired heart rate variability, systemic chronic inflammation, Hypothalamic–pituitary–adrenal (HPA) axis dysfunction and endothelial dysfunction. Such mechanisms are not only associated with complications in the advanced stages of the disease but also may speed up the connection between depression and CVDs in the initial stages [45].

4.1. Impaired heart rate variability

Heart rate variability was considered as a marker of vagal activity [46]. Some studies observed the relationship between impaired autonomic function and severity of coronary artery disease, which indicated that abnormal heart rate variability-related depression might trigger early atherosclerosis and/or speed up its progression via platelet aggregation, irritable inflammation, and changes in lipid metabolism [47]. In addition, imbalanced heart rate variability may increase coronary heart disease mortality and accelerate coronary atherosclerosis in depressive patients by inducing myocardial ischemia, ventricular dysrhythmias, and sudden death, and is associated with post-infarct mortality [48–50].

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