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Review Article

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Research Progress of Atherosclerosis-Related Youth Stroke

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Abstract

In recent years, the incidence of ischemic stroke has shown a trend of younger people, which has caused serious harm to young people's daily life and physical health. Therefore, youth ischemic stroke has also received more and more attention from the medical community. Atherosclerotic stroke is the main cause of stroke in young stroke patients. Therefore, early prevention, early diagnosis, early intervention and effective treatment of atherosclerosis are particularly important. In this paper, by reviewing domestic and foreign literature, a systematic overview of the risk factors of atherosclerotic stroke was carried out, and new ideas for atherosclerotic stroke were provided.

Keywords: Atherosclerosis; Stroke; Youth; Research Progress

Foreword

Stroke is the cause of high morbidity, morbidity and mortality in my country. With the change of living standards, the incidence of stroke among young people continues to rise, and the incidence is gradually younger, of which more than 70% are ischemic stroke [1]. Youth stroke refers to cerebrovascular disease that occurs in young people aged 18 to 45. Studies have shown that early-onset atherosclerosis is the main cause of stroke in young people. In addition, the risk factors for early-onset atherosclerosis in young people were analyzed, and it was found that 44.4% of patients had hypertension, 16.8% of patients had dyslipidemia, 13.8% of patients have diabetes, in addition, it is also related to factors such as smoking, sleep, and high homocysteine [2]. At present, it is believed that early diagnosis and early treatment of atherosclerosis are the best prevention and control measures. This article will summarize the relevant risk factors of early-onset atherosclerosis in combination with recent literatures, hoping to improve the prevention, delay and diagnosis of atherosclerosis. Atherosclerosis helps reduce stroke in atherosclerotic youth.

Atherosclerosis and Stroke

According to research reports, atherosclerosis is the most direct factor leading to stroke. Atherosclerosis can lead to stenosis of blood vessels in the brain, slowing blood flow, and the formation of thrombus blocking the blood vessels can cause stroke. Flow into the patient's brain, blocking the branches of blood vessels supplying the brain, can also cause stroke. After atherosclerotic plaques are formed, they can gradually grow and directly block blood vessels; unstable plaques can be ruptured to embolize distal blood vessels, and the rough surface of ruptured atherosclerotic plaques can stimulate coagulation factors to form thrombus; Under the distal perfusion pressure, stenosis after arterial obstruction can cause insufficient blood supply to the marginal zone, resulting in hypoperfusion infarction [3, 4].

Risk Factors for Stroke in Atherosclerotic Youth

Hypertension

Hypertension is one of the most important risk factors for atherosclerotic stroke in young people. A study conducted in northern my country found that among 1395 young stroke patients, the prevalence of hypertension was as high as 44.4%. Another study conducted showed that the prevalence of hypertension was 36.2% higher in young stroke patients, ranking second; in addition, more than 220 loci were shown to be closely associated with hypertension, and these Variants at genetic loci can affect blood pressure levels and increase the risk of hypertension [5]. Such as methylenetetrahydrofolate reductase C677T gene polymorphism and H-type hypertension, familial aldosteronism is a single gene hereditary hypertension and so on [6, 7]. These genetic factors will cause early hypertension in young patients, maintain blood pressure at a high state for a long time, and cause damage to the arterial intima, resulting in remodeling and thickening of the arterial intima, and atherosclerosis of small arteries; in the arterial intima After injury, lipid deposits are easily formed, which in turn promotes the formation of arteriosclerosis. In conclusion, increased prevalence of hypertension is a clear risk factor for younger stroke cases. The risk of stroke in youth may be substantially reduced through early prevention and treatment of hypertension.

Dyslipidemia

Studies have shown that the number of patients with lipid metabolism disorders in young ischemic stroke patients is increasing year by year [8]. On the one hand, lipid metabolism disorders can cause damage to vascular endothelial cells and smooth muscle cells, leading to atherosclerosis. The blood viscosity is relatively high, the body's ability to resist arteriosclerosis is reduced, and it is easy to form thrombosis, leading to the occurrence of stroke. Related genes that affect lipid metabolism disorders and participate in the formation of atherosclerosis include ApoA5, ApoE, lipoprotein lipase (LPL), etc. The two sites -1131T/C and 553G/T of the ApoA5 gene can promote blood lipids in the Deposition occurs in the carotid artery and internal carotid artery, thereby inducing the occurrence and development of arteriosclerosis; the E4 gene in the ApoE gene polymorphism is associated with hyperlipidemia and the formation of atherosclerosis; There have been 110 mutations in the LPL gene, resulting in higher plasma triacylglycerol levels and lower high-density lipoprotein levels [9-11]. Therefore, polymorphisms of lipid metabolism genes play an important role in ischemic stroke.

Diabetes

Diabetes is a direct risk factor for ischemic stroke in youth [12]. Studies have shown that young patients with a family history of type 2 diabetes are more likely to develop atherosclerosis; in the genetic research that leads to diabetes, it was found that the rs4977574 genotype of the CDKN2B-AS1 gene locus is not only related to glucose metabolism, but also causes the occurrence of atherosclerosis [13]. Cells proliferate rapidly and their adhesion increases, thereby increasing the risk of developing atherosclerosis [14]. In addition, there is a special type of diabetes, which is adult-onset diabetes caused by a single gene mutation, which reduces insulin secretion and leads to increased blood sugar levels in young patients; on the one hand, elevated blood sugar can lead to large blood vessels. The formation of atherosclerosis; on the other hand, it can lead to lesions of small blood vessels, causing occlusion of small blood vessels and causing microcirculation disorders. Diabetes screening in adolescents and well-controlled blood glucose levels would be beneficial in reducing the incidence of stroke in young adults.

Hyperhomocysteinemia

Studies have demonstrated that hyperhomocysteinemia is an independent risk factor for ischemic stroke in young adults, found in approximately half of young stroke patients [15]. Cystathionine β-synthase (CBS) is one of the key enzymes in the process of homocysteine metabolism, and about 50% of homocysteine is converted to cysteine by cystathionine β-synthase. The acid enters the sulfur removal cycle. So far, 5558 sites such as rs12613 [A/G] have been reported to change the amino acid sequence of cystathionine β-synthase. Studies have shown that T833C and G919A in the CBS gene are the sites with the highest mutation rate, which can damage the enzymatic activity of CBS and affect the metabolic pathway of homocysteine, resulting in the accumulation of homocysteine in the blood, high homocysteine Cysteine can cause endothelial dysfunction, promote smooth muscle proliferation, disrupt the balance of coagulation and fibrinolysis, and affect lipid metabolism to promote atherosclerosis [16]. CBS genetic studies may provide targets for drug therapy that modulates hyperhomocysteinemia and related vascular diseases.

Family Hypercholesterolemia (Fh)

FH is an autosomal genetic disease with obvious familial aggregation. It has been confirmed that the mutation of FH gene can reduce the clearance of low-density lipoprotein (LDL), affect the body's cholesterol metabolism, cause hypercholesterolemia, and cause hypercholesterolemia. It promotes the deposition of LDL particles in the damaged arterial endothelium, which eventually leads to atherosclerotic vascular lesions. In the study of related mutant genes of FH, it was found that the encoding proprotein convertase subtilisin/kexin type 9 (PCSK9) is located on the human chromosome 1p32 near the third genetic locus. Density lipoprotein receptor (LDLR) binding leads to elevated levels of circulating LDL-cholesterol (LDL-c), promoting the development of atherosclerosis. A study using a humanized hPCSK9-KI mouse model demonstrated that hypercholesterolemia was driven by the expression of the human PCSK9 gene, and that base editing using PCSK9 guide RNA reduced plasma levels of human and mouse PCSK9 and total cholesterol [17]. At present, the development of PCSK9 inhibitors has been studied as a statin drug for lipid regulation. For FH patients, taking statins early can help control the level of blood lipids and delay the occurrence and development of atherosclerosis.

Lipoprotein(A)

Lipoprotein(a) [LP(a)] is a kind of low-density lipoprotein-like particle, which is considered to have pro-atherosclerosis and prothrombotic effects. Analyzed several stroke events and concluded that high levels of Lp(a) are not only an independent risk factor for ischemic stroke, but also make young people suffer from atherosclerotic ischemic stroke [18]. The risk of stroke was significantly increased, suggesting that Lp(a) may be a potential risk factor for unexplained youth stroke. Regarding the mechanism of Lp(a) involved in promoting atherosclerosis: Lp(a) molecule can be oxidized by polyunsaturated fatty acid residues to form oxidized Lp(a) molecule, and oxidized Lp(a) molecule is more than Lp(a) molecule. Stronger atherogenic effects, both of which can up-regulate the expression of adhesion factors, promote the production of inflammatory factors, increase the permeability of vascular endothelial cells and the accumulation of inflammatory cells, resulting in abnormal vascular endothelial cell function and proliferation, Smooth muscle migration increases platelet adhesion, leading to atherosclerosis [19, 20]. Therefore, Lp(a) molecule can be used as a serum marker for screening young stroke patients.

Salusins

Studies have shown that Salusins can be involved in the formation of atherosclerosis, consisting of Salusin-α and Salusin-β. In a pro-

spective study of obese children abroad, it was shown that there was a negative correlation between Salusin-α and diastolic blood pressure, and indicated that Salusin-α may be an early marker of cardiovascular disease in obese children [21]. Since renal disease patients treated with hemodialysis have a higher cardiovascular mortality rate and this mortality rate is related to the exacerbation of atherosclerosis, studied in 180 patients receiving hemodialysis [22, 23]. of patients had higher Salusin-β/Salusin-α ratios and increased risk of cardiovascular disease. Salusins is a bioactive peptide that mainly exists in the hematopoietic system, endocrine system and central nervous system, and has blood pressure lowering and mitogen-like effects. Current research believes that the two classifications of salusins have opposite effects on the formation of foam cells. Salusin -β promotes atherosclerotic plaque formation, while Salusin-α inhibits atherosclerotic plaque formation. Therefore, whether the serum Salusin-β level is increased or the Salusin-α level is decreased can be used as an indicator for the diagnosis of AS. But serum Salusin-α has higher sensitivity and specificity, so it is more likely to be a marker for the diagnosis of AS. Due to the lack of current clinical studies, whether Salusin-α or Salusin-β can be prioritized as a marker for diagnosing atherosclerosis, or both can be a marker for diagnosing atherosclerosis, more in-depth research is still needed.

Gut Flora

The latest research shows that intestinal flora can affect the occurrence and development of atherosclerosis, which is a hot research topic at present. Trimethylamine oxide (TMAO) is produced from nutrients in food under the action of intestinal flora [24]. Regarding the specific mechanism of TMAO and atherosclerosis, studies have found that TMAO can up-regulate the number of scavenger receptors on the surface of macrophages, and then cause vascular endothelial cell damage through oxidative stress and inflammatory responses, and increase vascular cell adhesion factors [25]. Expression, promotes the increase of monocyte adhesion ability, and on the basis of massive accumulation of cholesterol, leads to the increase of foam cells and participates in the formation of atherosclerosis. Many studies have shown that high levels of TMAO in plasma are closely related to the development of atherosclerosis, and it is expected to provide new treatment ideas for atherosclerosis by regulating the intestinal flora, especially in adolescents. Overeating, irregular eating, and excessive drinking can easily lead to intestinal flora imbalance, so non-antibiotic treatment to interfere with the intestinal flora is an important aspect of current research to prevent atherosclerotic stroke in young people [26, 27].

Lack of Sleep

Insufficient sleep is an important factor affecting stroke in young adults, and 17.9% of stroke patients with less than 6 hours of sleep were found [28]. A recent study found that sleep deprivation reduces the secretion of hypocretin in the brain, increases the expression of CSF1 in bone marrow stem cells, promotes hematopoiesis to produce more white blood cells, and then triggers atherosclerosis by interfering with sleep time in mice [29]. Although insufficient sleep can lead to atherosclerosis, too much sleep is also associated with a higher risk of stroke [30]. Especially in today's society, the temptation of mobile phones, alcohol and caffeine has made adolescents sleep irregularly and stay up late. According to the above research, it is suggested that adolescents need an ideal sleep time of 8-10 hours a day, which can inhibit the occurrence and development of atherosclerosis. Reducing the risk of stroke in youth.

Summary

Atherosclerosis is the primary cause of stroke in young people. How to prevent and diagnose atherosclerosis early is the top priority to reduce stroke in young people. This article describes the risk factors associated with atherosclerosis. These risk factors may be used to predict atherosclerotic stroke in young people, so that early intervention treatment at the same time as the occurrence of atherosclerotic stroke in young people can reduce the incidence of AS and effectively improve the survival rate.

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