Vulnerable plaque

Atherosclerosis (AS) is considered one of the primary causes of cardiovascular diseases (CVDs). Unpredictable rupture of a atherosclerotic vulnerable plaque triggers adverse cardiovascular events such as acute myocardial syndrome (ACS) and even sudden death (SCD). Therefore, assessing the vulnerability of atherosclerotic plaques and early intervention is significant in reducing CVD mortality.

“Vulnerable” plaques are atherosclerotic plaques likely to cause thrombotic complications or those that tend to progress rapidly. Criteria for vulnerable plaques include intimal thickening, plaque fissure, lipid/necrotic core with thin fibrous cap, calcification, thrombus, intraplaque hemorrhage, and outward remodeling. Some of these features can be identified with high-resolution MRI [1) 2) 3) 4)]

Nanomedicine possesses tremendous advantages in achieving the integration of the diagnosis and therapy of atherosclerotic plaques because of its magnetic, optical, thermal, and catalytic properties. Based on the pathological characteristics of vulnerable plaques, stimuli-responsive nanoplatforms and surface-functionalized nanoagents have been designed and drawn great attention for accomplishing the precise imaging and treatment of vulnerable atherosclerotic plaques due to their superior properties, such as high bioavailability, lesion-targeting specificity, on-demand cargo release, and low off-target damage. Zhang et al. generalized the characteristics of vulnerable plaques, and systematically summarized some targeted strategies for boosting the accuracy of plaque vulnerability evaluation by imaging and the efficacy of plaque stabilization therapy (including antioxidant therapy, macrophage depletion therapy, regulation of lipid metabolism therapy, anti-inflammation therapy, etc.). In addition, they discussed existing challenges and prospects in this field and believe it will provide new thinking for the diagnosis and treatment of CVDs in the near future [5)].

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