Vascular smooth muscle cells

Vascular smooth muscle cells (VSMCs) are the cellular components of the standard blood vessel wall that provides structural integrity and regulates the diameter by contracting and relaxing dynamically in response to vasoactive stimuli.

Smooth muscle is found within the walls of blood vessels (such smooth muscle specifically being termed vascular smooth muscle) such as in the tunica media layer of large (aorta) and small arteries, arterioles and veins. Smooth muscle is also found in lymphatic vessels, the urinary bladder, the uterus (termed uterine smooth muscle), male and female reproductive tracts, the gastrointestinal tract, the respiratory tract, the erector pili of skin, the ciliary muscle, and the iris of the eye. The structure and function are basically the same in smooth muscle cells in different organs. Still, the inducing stimuli differ substantially, in order to perform individual effects in the body at individual times. In addition, the kidneys' glomeruli contain smooth muscle-like cells called mesangial cells.

Vascular smooth muscle cells (VSMCs) dysfunction participates in carotid artery stenosis (CAS). The study aimed to examine the expression pattern of miR 361-5p in CAS patients and explore its role in VSMCs proliferation and migration.

qRT-PCR was performed for the detection of miR-361-5p in serum samples of 150 CAS cases and 150 healthy people. Multiple logistic regression analyses and receiver operating characteristic (ROC) curves were accomplished to detect diagnostic values via SPSS 21.0 statistical software. The cell function of VSMCs was evaluated. Target association was predicted through bioinformatic analysis and confirmed via luciferase activity.

Results: Serum miR-361-5p was enhanced in CAS cases and was positively correlated with CAS degree. Logistic regression analysis determined the independent influence of miR-361-5p in CAS, and ROC curve demonstrated its diagnostic value with AUC of 0.892. miR-361-5p promoted VSMCs proliferation and migration, but the influence was counteracted by TIMP4.

miR 361-5p is a promising biomarker for carotid artery stenosis and can be used as a potential target for early diagnosis and treatment of CAS. MiR-361-5p can promote VSMCs proliferation and migration by targeting TIMP4 [1)].

Dysfunction of vascular smooth muscle cells (VSMCs) plays a critical role in the intracranial aneurysm pathogenesis (IA). Circular RNAs (circRNAs) have been implicated by reducing microRNA (miRNA) activity. Qin et al. investigated the precise roles of circRNA ADP ribosylation factor interacting protein 2 (circ-ARFIP2, circ_0021001) in VSMC dysfunction. The levels of circ-ARFIP2, miR-338-3p and kinase insert domain receptor (KDR) were detected by quantitative real-time polymerase chain reaction (qRT-PCR) or western blot. Ribonuclease (RNase) R and subcellular fractionation assays were used to assess the stability and localization of circ-ARFIP2, respectively. Cell viability was detected by Cell Counting Kit-8 (CCK-8) assay, and cell invasion was measured by transwell assay. Cell proliferation was gauged by 5-Ethynyl-2'-Deoxyuridine (EdU) assay. Cell migration was evaluated by transwell and wound-healing assays. Targeted correlations among circ-ARFIP2, miR-338-3p and KDR were validated

by dual-luciferase reporter and RNA immunoprecipitation (RIP) assays. Circ-ARFIP2 and KDR were underexpressed and miR-338-3p was overexpressed in the arterial wall tissues of IA patients. Overexpression of circ-ARFIP2 in human umbilical artery smooth muscle cells (HUASMCs) showed a significant promotion in cell proliferation, migration and invasion. Mechanistically, circ-ARFIP2 targeted miR-338-3p, and circ-ARFIP2 regulated cell behaviors by miR-338-3p. KDR was a direct and functional target of miR-338-3p. Moreover, KDR was a downstream effector of circ-ARFIP2 function. Circ-ARFIP2 regulated KDR expression by targeting miR-338-3p.The findings demonstrated that the increased level of circ-ARFIP2 enhanced HUASMC proliferation, migration and invasion at least in part by the miR-338-3p/KDR axis [2)].

1)
Wang F, An Y, Hao H. MicroRNA-361-5p acts as a biomarker for carotid artery stenosis and promotes vascular smooth muscle cell proliferation and migration. BMC Med Genomics. 2023 Jun 16;16(1):134. doi: 10.1186/s12920-023-01563-2. PMID: 37328892.
2)
Qin K, Tian G, Zhou D, Chen G. Circular RNA circ-ARFIP2 regulates proliferation, migration and invasion in human vascular smooth muscle cells via miR-338-3p-dependent modulation of KDR. Metab Brain Dis. 2021 Apr 10. doi: 10.1007/s11011-021-00726-3. Epub ahead of print. PMID: 33837886.