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Analysis of Adipose Tissue-Derived Mesenchymal Stem Cells under Atherosclerosis Microenvironment

Authors : Do Khanh Vy, Vuong Cat Khanh, Osamu Ohneda

Abstract : During atherosclerosis (AS) progression, perivascular adipose tissue-derived mesenchymal stem cells (PVAT-MSCs) are exposed to the hypoxic environment due to the oxygenic deprivation which might influence the adipose tissue-derived mesenchymal stem cells (AT-MSCs) function. Additionally, it has been reported that the angiogenic ability of subcutaneous AT-MSCs (SAT-MSCs) was impaired in the AS patients. However, up to now, the effects of AS on the characteristics and function of PVAT-MSCs have not been clarified yet. In the present study, we analyzed the AS microenvironment effects on the characteristics and function of AT-MSCs. We found that there was no significant difference in cellular morphology and differentiation ability between SAT-MSCs and PVAT-MSCs in AS patients. However, the proliferation of AS-derived PVAT-MSCs was less than those of AS-derived SAT-MSCs. Importantly, the migration of AS-derived PVAT-MSCs was faster than AS-derived SAT-MSCs. Of note, AS-derived PVAT-MSCs showed the upregulation of SDF1, which is related to the homing, and VEGF, which is related to the angiogenesis compared to those of AS-derived SAT-MSCs. Consistent with these results, AS-derived PVAT-MSCs showed the higher ability to recruit EPCs and ECs than AS-derived SAT-MSCs. In addition, EPCs and ECs which cultured in the presence of AS-derived PVAT-MSC conditioned medium showed the higher angiogenic function of the tube formation compared to those cultured in AS-derived SAT-MSC conditioned medium. This result suggests that the higher paracrine effects of AS-derived PVAT-MSCs support the angiogenic function of the target cells. Our data showed the different characteristics and functions of AT-MSCs derived from different sources of tissues. Under the AS microenvironment, it seems that the characteristics and functions of PVAT-MSCs might reflect the progression of AS. Further study will be necessary to clarify the mechanism in the future.

Keywords : atherosclerosis, mesenchymal stem cells, perivascular adipose tissue, subcutaneous adipose tissue
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