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Mesenchymal stromal cell Isolated from healthy and aneurysmal abdominal aortas: a morphological and biochemical study

Gabriella Teti[1], Elio Piccinini[2], Laura Ingrà[1], Alessandra Ruggeri[1] and Mirella Falconi[1]

[1] Università Di Bologna, Dipartimento Di Scienze Biomediche E Neuromotorie, Bologna, Italia
[2] RSH- AUSL Romagna, Ospedale Ravenna, cardiovascular department, Ravenna, Italia

Abdominal aortic aneurysm (AAA) is a common degenerative vascular disorder associated with sudden death due to aortic rupture. The current clinical approaches are to monitor aortic dimensions and to perform an open or endovascular surgical repair when the aortic diameter has attained sufficient expansion, condition that predispose to a high likelihood of aortic rupture.

Although several studies have identified many potential mechanisms involved in AAA pathogenesis, a clear depth understanding is still lacking and further studies are needed to facilitate development of effective therapies. Recent discoveries have demonstrated the presence of mesenchymal stromal cells (MSCs) in human aortic layers. These cells possess high proliferative capacity and potential to generate endothelial, smooth muscle, hematopoietic and mesenchymal cell progeny. Nevertheless, any defect of the proliferation and/or the differentiation process of vascular stem cells may determine the development of human vascular diseases. The aim of this study was to demonstrate the presence of senescent MSCs residing in human abdominal aortic wall, which could have a role in the AAA pathogenesis.

MSCs isolated from healthy (HAA - MSCs) or aneurysmal abdominal aortas (AAA – MSCs) were characterized for their proliferation rate, ultrastructural morphology, senescence-associated β-galactosidase activity and differentiation properties.

Results showed low growth potential, high senescence-associated β-galactosidase activity, an increased cell surface area, a reduced amount of autophagic and lysosome vesicles in AAA – MSCs compared to HAA - MSCs, thus indicated a senescent phenotype in AAA MSCs.

Vascular wall-resident MSCs are deeply involved in the process of vascular remodelling, that is a dynamic and strictly regulated process of structural changes occurs as a result of a pathological vascular trigger. The presence of a senescent population of AAA MSCs in vascular wall could have implications in the genesis and progression of vascular diseases, such as AAA.

Key words

Mesenchymal stem cells, aneurysm, vascular wall, senescence.

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