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MEETING ABSTRACT Open Access

Hematopoietic stem cells for neovascularization and wound repair

P Iacopino[1*], MF Lombardo[1,2], M Cuzzola[1], G Irrera[1], E Spiniello[1], C Garreffa[1], R Saccardi[3], R Piro[4], G Grossi[4], M Fiasché[5], D Mannino[6], A Verma[7], C Morabito[5], N Kasabov[7]

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Background

It is now well-known that a critical part of normal healing for cutaneous wounds is the formation of new blood vessels. As implantation of autologous bone marrow (BM)-derived Endothelial Progenitor Cells (EPC) into ischemic limbs has become a promising treatment for moderate to severe peripheral arterial occlusive disease (PAD), we have begun a Phase II randomized trial in Type 2 diabetes mellitus (T2DM). The goal of infusions is to promote neoangiogenesis, thereby increasing circulation, reducing symptoms, and facilitating wound healing. At first, we have studied EPC and gene expression profile (GEP) of peripheral blood, hypothesizing that it is possible to identify useful markers for the assessment of the severity of endothelial dysfunction.

Methods and results

Using the high-performance flow cytometer FACSCanto, we analysed peripheral blood samples from diabetic patients and healthy donors. We found that T2DM did not affect the number of early EPC, but greatly decreased the number of highly differentiated EPCs. In addition, T2DM increases the presence of both live and dead circulating endothelial cells (CEC), together with an increase in the number of activated CEC.

Relative quantification of 96 genes (TaqMan® Low Density Array) has been investigated. Notably, GEP in T2DM was always different from that found in controls. In particular, patients showed abnormal expression of VEGFs, AFGs, MMPs, TIMPs, CXCL12, HIF-1 alpha, IL-8 and AMPK.

Computational intelligence methods (NeuCom, WWKNN and TWNFI) for discovering important information from biological data were used for PAD risk prediction.

Conclusions

Our results suggest that (i) the endothelial damage is due more to an altered process of maturation/commitment/homing of EPC than just to a simple decrease in their production, ii) CEC could be useful markers for the assessment of endothelial dysfunction severity, (iii) GEP allows early identification of the patients, at risk for PAD development, who might benefit of stem cell therapy.

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Author details

[1]Centro Unico Regionale Trapianti Cellule Staminali, Reggio Calabria, Italy. [2]Dipartimento di Medicina Interna, Roma "Tor Vergata", Italy. [3]Dipartimento di Ematologia, Università di Firenze, Italy. [4]Unità di Diabetologia, Paola, Italy. [5]Unità di Diabetologia, Reggio Calabria, Italy. [6]DIMET Department, Reggio Calabria, Italy. [7]Knowledge Engineering and Discovery Research Institute, Auckland, Australia.

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[1]Centro Unico Regionale Trapianti Cellule Staminali, Reggio Calabria, Italy