EXPERIMENTAL REPORT - MD 327

ID19 18-21/9/2008

Experimental team: F.Fiori, A.Farini, C.Villa

3D visualization of human CD133+ stem cells in vivo using microCT after their systemic transplantation in a murine animal model of muscular tissue

Introduction. Cell therapy is an emerging approach of regenerative medicine with significant efforts in clinical areas. Stem cells cannot be easily observed directly when injected systemically, and their behaviors need to be visualized indirectly. Micro-CT is a non-invasive technique that exploits the attenuation of X-rays and offers the possibility to obtain a 3D visualization of the in vivo distribution of systemically injected stem cells. We focused on muscular dystrophy, in order to discover the mechanisms involved in muscle homing of stem cells.

Materials and Methods. FeO-nanoparticles labeled blood derived human CD133+ cells were injected into the femoral artery of dystrophic animal models and detected in vivo in muscle tissues of injected limb at different times by using micro-CT with high spatial resolution. Real-Time PCR analysis was performed to obtain a quantification of cells migrated from blood stream inside muscle tissues and organs.

Results. Immediately after the injection cells were concentrated in the injected quadriceps, while after 2 hours they reached the ischio-crural muscles in the posterior part; at 24 hours injected stem cells were also present in gastrocnemius; cells number increased 24 hours after the injection, indicating a progressive distribution and migration of cells. Within 2 hours after the injection, QPCR analysis confirmed micro-CT data, showing a large amount of cells in QA, ischio-crural and GAS. Intra-arterially injected cells were also found in filter organs.

Conclusions. Intra-arterially injected cells continue to migrate within the muscles of the injected limbs with a specific spatiotemporal distribution. We tried to explain these data in several different ways. Firstly, intra-arterially injected stem cells clustered within capillaries of muscles nearly the site of injection and migrate subsequently in other muscles after spontaneous clusters dissolution. Secondly, injected CD133 cells represent an heterogeneous population of stem cells with different capacity of muscle tissue homing.