Proliferation and Differentiation of Mesenchymal Stromal Cells from Osteoarthritic Donors

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Introduction
Osteoarthritis (OA) is one of the most frequent musculoskeletal disorders and represents the main indication for total joint arthroplasty [1]. Multipotent mesenchymal stromal cells (MSCs) can be easily isolated and cultured expanded from bone marrow aspirates and provide an excellent source of progenitor cells. [2]. To assess whether advanced-stage OA affects MSCs’ suitability for musculoskeletal regenerative therapy we compared proliferation and differentiation potential of MSCs from osteoarthritic versus healthy donors.

Materials and Methods
Clinical data raised implied routine medical examination including range of motion of lower limb joints, sociodemographic core dataset, WOMAC score, EQ-5D score, Harris Hip Score, radiological evaluation (OA group only), routine laboratory parameters, and bone metabolism parameters. Subjects with bone metabolism-affecting medication were excluded from the study. MSCs were isolated from bone marrow aspirates obtained from the pelvic compartment of n=14 advanced-stage osteoarthritic and n=15 age-matched healthy donors by standard Ficoll gradient-separation and polystyrene adhesion. MSCs were cultured in basic (DMEM, 10% FCS), osteogenic, adipogenic and chondrogenic medium for up to 21 days. For all assays low-passage MSC populations were used. Proliferation was assessed by total DNA quantification, FACS analysis and CFU-F assay. Osteogenic, chondrogenic, and adipogenic differentiation was proofed qualitatively by cell staining and by osteogenic (Runx-2, ALP, BSP2), chondrogenic (Sox9, CollIa, CollX), and adipogenic (PPARγ, FABP4) marker gene expression analysis using quantitative real-time RT-PCR. Additionally, osteogenic differentiation was evaluated by cell-specific alkaline phosphatase (ALP) activity assay. Overall statistical significance was defined as p<0.05 (two-sided) based on all pairwise comparisons using Mann-Whitney test. The study was approved by the local ethics review board (protocol # EK203082008).

Results
WOMAC, EQ-5D and Harris-Hip-Score of osteoarthritic donors were significantly (p<0.0001) lower compared to healthy donors. No significant differences between osteoarthritic and healthy donors concerning the proliferation potential, specific ALP activity and gene expression of MSCs could be determined.

Discussion and Conclusions
The regenerative potential of MSCs from osteoarthritic donors is comparable to MSCs from healthy donors. These data will help to facilitate the application of cell-based strategies for musculoskeletal tissue regeneration.

References
1. www.jru.orthop.gu.se

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