Effect of the Shear Stress in the Human Bone Marrow Mesenchymal Stem Cell Behavior
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Introduction
Shear stress has been previously reported to be a powerful differentiation stimuli (1,2). However, other effects (proliferation, migration) on Human Bone Marrow Mesenchymal Stem Cells (MSCs) have not been deeply studied. Our main goal is to determine if the shear stress is able to affect not only differentiation but also other important cell processes such as cell proliferation, migration or cell adhesion.

Materials and Methods
Bone Marrow Mesenchymal Stem Cells have been seeded in µ-Slide I flow kit (Ibidi) and cultured under a shear stress of 5 dynes/cm² in a perfusion bioreactor (TEB-1000, EBERS) for 7 days. Proliferation was determined after cell counting and apoptosis (Annexin V) was measured with flow citometry techniques. Migration experiments were performed in a multidimensional microscope for 24 hours. Immunofluorescent staining to determine the cell area and cytoskeleton organization was carried out in a confocal microscope. Expression of the cell adhesion molecules was determined by RT-PCR. ANOVA and t-student tests were carried out to determine statistical differences.

Results
Significant differences in cell proliferation have been observed after 7 days between static and shear stimulated cells (Fig.1). However, no significant differences in apoptosis were obtained between both studied groups (Fig.2). Differences in cell area, speed of migration, cytoskeleton organization and adhesion molecules has been also observed. In a future, we will try to determine the effect of different shear stress ratios on the previously described variables.

Discussion and Conclusions
A shear stress treatment previous to the cell seeding should be taken into consideration due to the positive effects of this mechanical stimulus on the MSCs.

References

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