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Segmental characterization of the cellular density of human knee meniscus

IF Cengiz[1,2], H Pereira[1,2], J Espregueira-Mendes[1,2], JM Pego[2], JM Oliveira[1,2] and RL Reis[1,2]
[1]3B's Research Group – Biomaterials, Biodegradables and Biomimetics, University of Minho, AvePark, Zona Industrial da Gandra, S. Cláudio do Barco, 4806-909 Caldas das Taipas – Guimarães, Portugal; [2]ICVS/3B's, PT Government Associated Laboratory, Braga/Guimarães, Portugal

Meniscus is a fibrocartilaginous tissue that has an important role in biomechanics of the knee joint. Fibrochondrocytes and fibroblast-like cells are the two main cell populations present in the meniscus. Meniscus is distinguished into two regions: avascular and vascular region. Cellularity varies within the human meniscus, specifically between avascular and vascular regions of the meniscus, but also between anterior, medial and posterior parts. Cellularity is one of the important characteristics that should be considered in tissue engineering and regenerative medicine strategies. The aim of this study is to calculate the 3D cell density of human meniscus using histological slides. Meniscus tissues obtained from donors are prepared into Giemsa stained histological slices with a thickness of 30 μm. Slices are grouped by their anatomical location into three parts: anterior, medial and posterior. Cells in the defined areas of avascular and vascular regions are counted either as fibrochondrocytes or as non-fibrochondrocytes using a stereomicroscope. 3D cell densities of different region and parts of the meniscus are estimated by calculating the number of the cells found in unit volume. The initial results show that the 3D cell density is around 8000 cells/mm3in vascular part that is the almost double of the density in avascular part. Chondrocytes take up more than the half of the total cell amount in avascular part, and less than the half in the vascular part. This work aims to contribute to the knowledge of cellularity of human meniscus and facilitates the development of more efficient strategies for meniscus tissue engineering. The authors thank the financial support of the MultiScale-Human project (Contract number: MRTN-CT-2011-289897) in the Marie Curie Actions—Initial Training Networks.