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Meniscal femoral and tibial surfaces characterization in the swine model.

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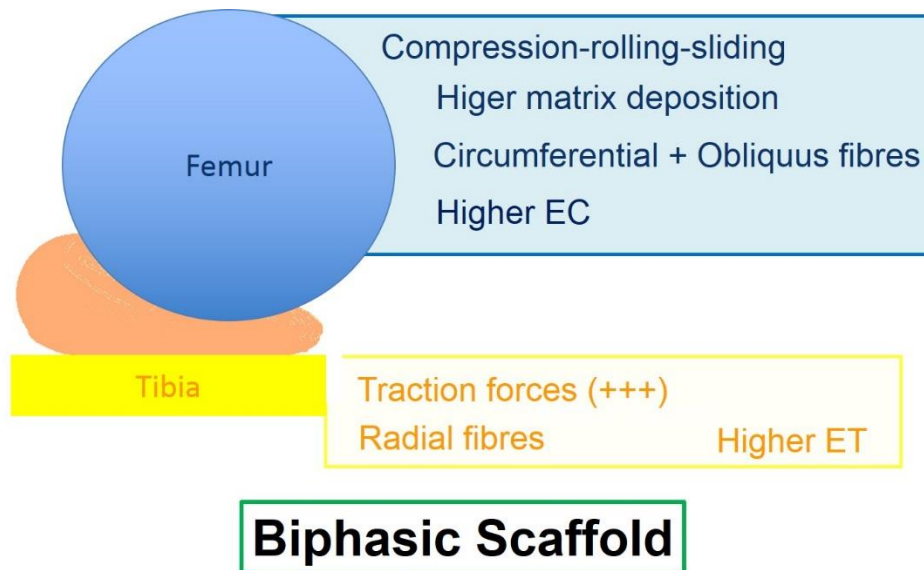
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Menisci are wedge-like structures interposed, in the knee joint, between the femoral and the tibial articular heads (Kohn et al., 1995, Greis et al., 2002). Improving the articular surface, the cellular nutrition and the articular lubrication, they are essential structures for the prevention of gonarthrosis (Proctor et al., 1989, Makris et al., 2011). This study is focused upon the relationship between the contact forces at the femoral and tibial surfaces and the corresponding structure of these meniscal surfaces. For this purpose, 20 adult (~9 months old) female pigs (Landrace x Large white, average weight 75–90 kg; n=80 meniscal samples) were obtained from a local slaughterhouse and dissected to isolate the menisci. Swine meniscal samples were evaluated from morphological (Safranin-O, Sirius Red and collagen type I and II) (Di Giancamillo et al. 2014), biochemical (DNA and glycosaminoglycans, or GAGs, contents) and biomechanical (compression and traction tests) points of view at the level of femoral and tibial meniscal surfaces. Results revealed a characterization of the meniscus which is biomechanical-dependent. The femoral surface, morphologically characterized by the interposition of radial and oblique fibers and biomechanically by the femoral condyles compression, sliding and rolling forces, shows a higher compressive modulus ($p < 0.05$) and a greater amount of cells and GAGs deposition ($p < 0.01$ for each analysis). On the other hand, results from traction test revealed a higher tensile modulus ($p < 0.05$) in the tibial surface, characterized by a circumferential arrangement of the fibers and a poorer GAGs deposition and cellular distribution ($p < 0.01$). Results (summarized in the Figure 1) from this work suggest that a biphasic “femoral-to-tibial” scaffold that mimic the different behavior and composition of the two meniscal surfaces could be useful in the light of meniscal replacement.

In both animal models, immunohistochemistry revealed stromal immunoreactivity for TIMP-1 and THBS-2, while MMP-7 expression was mainly localized on epithelial cells. All the markers showed progressive increase of staining intensity along with PanIN progression.

In conclusion, the investigated circulating molecules represent promising biomarkers for early diagnosis of PDAC and to monitor the response to treatment in human patients. Both tumoral cells and associated stroma play a role in the production and release of such biomarkers which, in addition, represent also biologically relevant molecules in remodeling the tumor microenvironment, by a complex network of interacting molecules.

Figure 1: Summarized results: femoral vs tibial meniscal surfaces.



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