

Healing of meniscal tissue by cellular fibrin glue: An in vivo study.

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Abstract:

Menisci represent fundamental structures for the maintenance of knee homeostasis, playing a key role in knee biomechanics. However, their intrinsic regenerative potential is poor. As a consequence, when a lesion occurs and the meniscus is partially removed by surgery, knee mechanics is subject to dramatic changes. These have been demonstrated to lead often to the development of early osteoarthritis. Therefore, menisci should be repaired whenever possible. In the last decades, tissue engineering approaches have been advocated to improve the reparative processes of joint tissues. In this study, the bonding capacity of an articular chondrocytes-fibrin glue hydrogel was tested as a biologic glue to improve the bonding between two swine meniscal slices in a nude mouse model. The composites were wrapped with acellular fibrin glue and implanted in subcutaneous pouches of nude mice for 4 weeks. Upon retrieval, a firm gross bonding was observed in the experimental samples while none of the control samples, prepared with acellular fibrin glue at the interface, presented any sign of bonding. This was consistent with the histological and scanning electron microscope findings. In particular, a fibrocartilaginous tissue was found at the interface between the meniscal slices, partially penetrating the native meniscus tissue. In order to overcome the lack of regenerative properties of the meniscus, the rationale of using cellular fibrin glue is that fibrin provides immediate stability while carrying cells in the site of lesion. Moreover, fibrin gel is recognized as an optimal scaffold for cell embedding and for promoting fibrocartilaginous differentiation of the cells which synthesize matrix having healing property. These results demonstrated the potential of this model for improving the meniscal bonding. However, further

orthotopic studies in a large animal model are needed to evaluate its potential for clinical application.

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