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The role of type I collagen in full-thickness articular cartilage repair

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Objective: Type I collagen is well used for cartilage repair. However its own role is not understood and it has been used simply as 'scaffold'. Our objective is to demonstrate the role of type I collagen itself for the cartilage repair by detail histological evaluation.

Methods: 5mm-diameter full-thickness articular cartilage defect was created at patellar groove of rabbit knee joint. 1) Defect with no implant, 2) Defect with collagen gel were made and evaluated. Toluidine blue staining, type I and II collagen IHC for qualitative analysis, BrdU for detect of proliferating cell, moreover triple staining of BrdU, CD44, and CD45 using CLSM and TEM were performed for cell type defection.

Results: Articular cartilage repair was promoted in defect with collagen gel. There are many proliferating cells in the peripheral area of defect with collagen gel. Many of these cells were mesenchymal stem cells [1].

Conclusions: Type I collagen gel actively enhance recruitment of mesenchymal stem cells from bone marrow. Utilizing this function, we try new approach for cartilage repair using only type I collagen gel [2].

REFERENCES

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Over-stress of cyclic compressive load on human synovium-derived cells in three-dimensional cultured tissue induces prolonged MMP-3 gene expression

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Previous our studies revealed that human synovium-derived cells in three-dimensional collagen-based cultured tissue express MMP genes after cyclic compressive load for five days.

Objective: The objective of this study was to examine the time course of mRNA expression levels of MMP genes after cyclic compressive load for one hour.

Materials and methods: Human mesenchymal cells were isolated from knee synovium and cultured in monolayer. Collected cells (5.0×10⁵/scaffold) were suspended in 0.5% atellocollagen gel and incorporated into a collagen scaffold(diameter 5mm×3mm) by centrifugal force to construct three-dimensional tissue. After 3 days incubation, unconfined uni-axial cyclic compressive load was applied for 1 hour at 0, 20 or 40kPa in the frequency of 0.5 Hz using a custom-made cyclic load bioreactor. Histological analysis was performed by hematoxylin-eosin staining and DAPI-phalloidin staining. mRNA expression levels for MMPs and inflammatory cytokines genes were analyzed at pre-load and 0, 3, 6, 12, 24 hours after loading by real time RT-PCR.

Results: mRNA expression levels for MMP-1, MMP-9 and IL-8 increased up to 6 hours after loading, and then resumed after 12 hours. mRNA expression level for IL-6 increased until 3 hours after load, and then decreased. mRNA expression level for MMP-3 increased and prolonged up to 24 hours after loading. mRNA expressions for MMP-13, TIMP-1 did not change after cyclic compressive load.

Conclusions: The time course of MMP-3 gene expression level was different from those of other MMPs or ILs and its gene expression increased and prolonged after one hour cyclic compressive load on human synovium-derived cells in three-dimensional collagen-based cultured tissue.