Comparative repair capacity of knee osteochondral defects using regenerated silk fiber scaffolds and fibrin glue with/without autologous chondrocytes during 36 weeks in rabbit model.

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Abstract:

The reconstruction capability of osteochondral (OCD) defects using silk-based scaffolds has been demonstrated in a few studies. However, improvement in the mechanical properties of natural scaffolds is still challengeable. Here, we investigate the in vivo repair capacity of OCD defects using a novel Bombyx mori silk-based composite scaffold with great mechanical properties and porosity during 36 weeks. After evaluation of the in vivo biocompatibility and degradation rate of these scaffolds, we examined the effectiveness of these fabricated scaffolds accompanied with/without autologous chondrocytes in the repair of OCD lesions of rabbit knees after 12 and 36 weeks. Moreover, the efficiency of these scaffolds was compared with fibrin glue (FG) as a natural carrier of chondrocytes using parallel clinical, histopathological and mechanical examinations. The data on subcutaneous implantation in mice showed that the designed scaffolds have a suitable in vivo degradation rate and regenerative capacity. The repair ability of chondrocyte-seeded scaffolds was typically higher than the scaffolds alone. After 36 weeks of implantation, most parts of the defects reconstructed by chondrocytes-seeded silk scaffolds (SFC) were hyaline-like cartilage. However, spontaneous healing and filling with a scaffold alone did not eventuate in typical repair. We could not find significant differences between quantitative histopathological and mechanical data of SFC and FGC. The fabricated constructs consisting of regenerated silk fiber scaffolds and chondrocytes

are safe and suitable for in vivo repair of OCD defects and promising for future clinical trial studies.