

Collagen Gel in Hip Cartilage Repair: in vivo Preliminary Study

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Abstract : Traumatic injury and age-related degenerative diseases associated with cartilage are major health problems worldwide. The articular cartilage is comprised of a relatively small number of cells, which have a relatively slow rate of turnover. Therefore, damaged articular cartilage has a limited capacity for self-repair. New clinical methods have been designed to achieve better repair of injured cartilage. However, there is no treatment that enables full restoration of it. The aim of this study was to evaluate how collagen gel with bone marrow mesenchymal stem cells (MSCs) and collagen gel alone will influence on the hip cartilage repair after injury. Collagen type I was isolated from rats' tails and cross-linked with N-hydroxysuccinimide in 24-hour process. MSCs were isolated from rats' bone marrow. The experiments were conducted according to the guidelines for animal experiments of Ethics Committee. Fifteen 8-week-old Wistar rats were used in this study. All animals received hip joint surgery with a total of 30 created cartilage defects. Then, animals were randomly divided into three groups and filled, respectively, with collagen gel (group 1), collagen gel cultured with MSCs (group II) or left untreated as a control (control group). Immunohistochemistry and radiological evaluation was carried out 11 weeks post implantation. It has been proved that the surface of the matrix is non-toxic, and its porosity promotes cell adhesion and growth. However, the in vivo regeneration process was poor. We observed the low integration rate of biomaterial. Immunohistochemical evaluation of cartilage after 11 weeks of treatment showed low II and high X collagen expression in two tested groups in comparison to the control one, in which we observed the high II collagen expression. What is more, after radiological analysis, we observed the best regeneration process in control group. The biomaterial construct and mesenchymal stem cells, as well as the use of the biomaterial itself was not sufficient to regenerate the hip cartilage surfaces. These results suggest that the collagen gel based biomaterials, even with MSCs, are not satisfactory in repair of hip cartilage defect. However, additional evaluation is needed to confirm these results.

Keywords : collagen gel, MSCs, cartilage repair, hip cartilage

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