Repair of experimental defects of articular cartilage in rabbits with homografts of fibrin sealant and embryonic chondrocytes.

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Abstract:

Background: Research about the repair of articular cartilage with heterograft chondrocytes is frequently reported, but the method may cause immune rejection. Since the embryonic cells possess lower antigenicity and stronger proliferation capability, it is hoped that they can be used as a novel carrier substitute in tissue engineering research. Design: A randomized grouping observation and comparative experiment. Setting: Histological Embryonic Laboratory in Guangxi Medical University. Materials: A big white adult New Zealand rabbit pregnant for 4 weeks was adopted; and another 24 big white adult New Zealand rabbits were selected, with no limitation in whether they were female or male and with a body mass of 2 to 2.5 kg. Methods: This experiment was carried out at the Histological Embryonic Laboratory in Guangxi Medical University between December 2000 and June 2002. The models of defects in articular cartilage were made artificially in femur medial malleolus of the mature rabbits. In the experimental group, defects were repaired by the implantation of Fibrin Sealant and embryonic chondrocytes mixture, but for the control group, only Fibrin Sealant was implanted or nothing was done about the defect. The restoration of articular cartilage defect was then observed 4,8 and 12 weeks after the operation, and was scored according to modified Pineda's method. The standard consists of 5 items, i.e., cellular morphology, matrix staining, surfacing smoothness, cartilage thickness and host union. 0 refers to normal and the higher the score is, the more serious the pathological changes are. Main Outcome Measures: 1 The gene ral observation of rabbit knee joint; 2 Histological observation of rabbit knee joints; 3 Histological semi-quantitative score of articular cartilage; 4 Appraisal of the curative effect of

articular cartilage defects. Results: Totally 24 rabbits were enrolled in this experiment and all entered the stage of result analysis. 1 The general observation of rabbit knee joint: In embryonic chondrocytes plus fibrin sealant group, the color in defect area was basically the same as that of the normal cartilage, showing a strong quality and better elasticity with the boundaries from the surrounding cartilage approximately vanishing. In Fibrin sealant group and the control group, the defect did not heal completely, but the defect area became small and filled with white fibrous tissues. 2 Histological observation of rabbit knee joints: In embryonic chondrocytes plus fibrin sealant group, tissues were predominated by hyaline cartilage, with bone tissues appearing in deeper position, and the surface was slightly raised or smooth, and the matrix showed normal staining, and were completely united with the surrounding cartilage and the division line was not clear. There was no lymphocyte infiltration in the tissues. In Fibrin sealant group and the control group, tissues were predominantly fibrous tissues, and part of them showed obvious residual hollow scar, connecting or partly connecting with the surrounding tissues. 3 Histological semi-quantitative score of articular cartilage: According to modified Pineda's method, the scores of embryonic chondrocytes plus fibrin sealant group after 12 weeks were obviously lower than those of the fibrin sealant group and the control group [(0.50+/-0.76) vs (7.88+/-1.13), (8.13+/-1.36), $P < 0.05$]; moreover, the difference between pure fibrin sealant group and the control group was of statistical significance 4 weeks after the operation ($P < 0.05$), but there was no obvious difference 8 and 12 weeks after the operation. 4 Appraisal of the curative effect of articular cartilage defects: 12 weeks after the operation, in the embryonic chondrocytes plus fibrin sealant group, the defect of 8 cases healed completely. In fibrin sealant group 1 case healed but not completely, and 7 cases did not get repaired for their defect. In the control group, 8 cases failed to get their defect repaired. Conclusion: The repaired tissues in embryonic chondrocytes transplantation group were basically the same as normal cartilage, obviously superior to the fibrin sealant group and the control group, suggesting that such method is feasible in the repair of articular cartilage defects.