Treatment of Deep Chondral Defects in the Knee with Autologous Chondrocytes Fixed on a Scaffold Form of Hyaluronic Acid Esters (Hyalograft C)

Abstract Aim

of the study

In the past few years we have seen further progress in the treatment of chondral defects by transplanting autologous chondrocytes. Different biomaterials are used as temporary carriers for fixation and an even distribution of chondrocytes in the defects. Since 2003 we have implemented a clinical trial for the treatment of deep chondral defects in the knee by transplanting autologous chondrocytes fixed in a scaffold from hyaluronic acid esters (Hyalograft C). This material has been evaluated in a prospective study.

Material

We evaluated results in 8 transplanted patients (7 males and 1 female, average age 31 years) with a minimal follow up of 9 months after surgery. Defects of an average size of 3,9 cm^2 were localized on femoral condyles.

Method

We evaluated the functional outcomes (IKDC, K.OOS, Lysholm score) and performed MRI before and 3, 6 and 12 months after surgery. The newly formed cartilage was controlled visually (ICRS visual score) during a second-look arthroscopy at 9 to 12 months after transplantation. We compared the stiffness of the repair tissue at the site of the original defect with the surrounding cartilage using a specially developod electromechanical indentation probe. Specimens for histological, histochemical and immunohistochemical studies were harvested from the site of transplanted chondrocytes.

Results

Improvement of the knee joint was confirmed in all patients at an average time of 10 months following surgery. The average IKDC subjective score improved from 46 points before surgery to 74 points after surgery. Using the KOOS scoring system, we observed a decrease in pain and improvement of function. When evaluating life quality, the average score improved from 35 points before surgery to 70 points at control. The preoperative Lysholm score was 61 points compared to 83 points postoperatively. We found a good correlation of MRI and arthroscopic findings. During second-look arthroscopy, die newly formed cartilage was evaluated as nearly normal in 6 and as abnormal in 2 cases. The average ICRS visual score was 9.4 points. No graft failure was detected. The newly-formed tissue had a histological picture of a mixed cartilage in 7 patients and a hyaline-like cartilage in 1 patient.

Conclusion

Functional improvement of the knee could be followed in all patients. Hyalograft C leads to formation of new cartilage at the defect site. A well-fixed tissue of mainly mixed (fibrohyaline) type formed in less than a year. The scaffold resorbed without problems. A one year period seems too short for complete remodeling of a newly formed immature cartilage tissue into hyaline cartilage. We conclude that Hyalograft C cartilage transplantation is a safe and efficient method for treatment of deep chondral defects in die knee. It is especially useful for patients with initial failures in cartilage defect treatment. A quick and easy application of Hyalograft C into the defect shortens the time of surgery, which may be beneficial especially in cases of complex surgeries (ligament repairs, osteotomies, etc.). Final evaluation of this method will be possible only with long-term follow up.