Abstract (AJ)

Introduction

Radiology examination using specialized modern imaging methods, including CT and MRI, is essential in the diagnosis of congenital and acquired diseases of the musculoskeletal system. The first part of the dissertation deals with certain congenital defects of the short femur, known in the literature as proximal femoral focal deficiency (PFFD). This part summarizes our experience with the radiological findings in the preoperative and postoperative period, with the main attention to the vascular supply to the affected area.

The second part of the presentation deals with some aspects of autologous chondrocyte transplantation fixed at two different carriers implanted into post-traumatic articular cartilage defects of the distal femur. Radiological findings are evaluated in the relation to the histopathological findings.

Objectives

The first part of the study after the distribution of patients with PFFD by current commonly used radiographic classification sets the objective in the extent of scans of the hip joints to specify diagnosis PFFD in each patient and to evaluate in detail changes in the area of disability, especially a course of blood vessels. The evaluation of the radiation burden of repeated X-ray measurements was done with respect to the age of the patients. Tissue samples from the area of disability taken during the corrective surgery were examined histologically, to confirm osteocartilaginous defect in the affected area.

In the second part of the study patients with traumatic lesions of the articular cartilage of the distal femur with a detectable MR examination were selected. After a subsequent transplant of autologous chondrocytes using two different scaffolds (Hyalograft C, Fidia Advanced Polymeres, Abano Terme, Italy and Chondrograft, National Tissue Bank, University Hospital Brno – Bohunice) and after repeated exams of the knee (arthroscopically for 10 – 12 months after transplantation and MR for 4 years from baseline) the aim was to compare the results of both biomaterials and mutually correlate radiological and histopathological findings.

Material and Methods

The first group of 21 patients (13 boys and 8 girls) including newly arrived patients, patients during treatment and post therapy was in the age of 1-17. At the beginning of monitoring each patient was repeatedly examined by X-ray and on CT using CTAG method. 6 patients had their tissue samples examined from the affected area obtained during reconstructive surgery.

The second group included 30 adults (25 men and 5 women) with an average age of 33 years who were arthroscopically diagnosed with post-traumatic articular cartilage defects of the femoral condyles. Biopsy was performed from the samples taken during arthroscopic examination. 12 patients received transplants of Hyalograft C on the Department of Orthopedics, 1st Faculty of Medicine, Charles University, Prague and Hospital Na Bulovce and 18 patients received transplants of Chondrograft, on Department of Orthopedics, 2nd

Faculty of Medicine, Charles University, Prague and Motol University Hospital. The control material for the normal structure of the femoral head cartilage was taken from 7 suddenly diseased and from 15 patients after TEP for traumatic fracture of the femoral neck. The second control group consisted of 12 heavily modified osteoarthrotic femoral heads removed during TEP implantation. Each of the 30 patients had the affected knee joint examined by MR twice - the first time during the month after transplantation and again at about 4 years from the first examination.

Results

Based on CT one patient was reclassified from PFFD diagnosis type II to type III sec. Pappas. CT scans allow tracking the mobility of the femoral head. CTAG examination in addition to changes in the diameter of AFC showed also changes of the position of the bifurcation of AFC on the affected side and even paradoxical proximal bifurcation of AFC on the contralateral side. In 2 patients these exams revealed a new abnormal vascular pattern around the affected lower limb which has not been reported in the literature before. Evaluation of the applied radiation dose brought about the finding that powerful new imaging methods used in modern modalities, with the respect to the overall radiation dose compared with the conventional X-ray examination, are higher but they give more valuable information. Histological findings in PFFD confirmed tissue failure in endochondral ossification.

Both transplant procedures for post-traumatic articular cartilage defects of the distal femur have produced good clinical results. Histological examination of the newly formed cartilage tissue showed no significant differences between the two groups of patients despite the difference in carriers and chondrocyte cultures. Hyalograft C consisted of predominantly undifferentiated mesenchymal cells and fibers of hyaluronic acid ester, Chondrograft was formed of fibrin and partially differentiated chondrocytes. Repeated MR examination showed that the transplants were functioning well and after 4 years did not change neither its character nor its size.

Conclusion

In the diagnostic algorithm of PFFD treatment it can be recommended to include one CT examination probably in the form of CTAG. The proper CTAG can lower the radiation dose to the necessary minimum and still reach an enormous benefit of information including the future trend of the therapy.

Transplantation of two different scaffolds with cultures of mesenchymal precursor cells of the various degrees of maturity or immature chondrocytes led to the healing of post-traumatic defects of articular cartilage and to the formation of a joint cover of very similar appearance. However, despite the positive results of the transplantation, neither group reached complete hyaline cartilage transformation. It is possible that the arthroscopic collection of the second sample was taken too early and there is also a possibility that at a later stage the cartilage recovery will be completed.

Key words

PFFD, CTAG, vascular anomaly, radiation proximal femoral focal deficiency,

posttraumatic defect of articular cartilage, knee joint, autologous chondrocyte transplantation, Hyalograft C, Chondrograft, magnetic resonance imaging, biopsy examination, immunohistochemistry