

THE OUTCOME OF AUTOLOGOUS CHONDROCYTE TRANSPLANTATION TREATMENT OF CARTILAGE LESIONS IN THE KNEE

MATEJ DROBNIČ¹, NEVENKA KREGAR-VELIKONJA^{2,3}, DAMJAN
RADOSAVLJEVIČ¹, MIRO GORENŠEK¹, BRANKO KORITNIK¹, ELVIRA
MALIČEV³, GORDANA WOZNIAK^{2,3}, MATJAŽ JERAS²
and MIOMIR KNEŽEVIČ^{2,3}

¹Department of Orthopaedic Surgery, Clinical Centre, Zaloška 9, SI-1000
Ljubljana, Slovenia, ²Blood Transfusion Centre of Slovenia, Tissue Typing
Center, Šlajmerjeva 6, SI-1000 Ljubljana, Slovenia, ³Educell d.o.o., Teslova 30,
SI-1111 Ljubljana, Slovenia

Abstract: Recent results of the clinical outcome of autologous chondrocyte transplantation (ACT) treatment in a group of 28 patients with focal femoral condyle cartilage lesions revealed a correlation trend with the quality of the *in vitro* cell culture matrix-protein synthesis. No impact of the patients' age and chondrocyte cryopreservation prior to implantation was observed. Further studies are needed to confirm the preliminary results.

Key Words: Cartilage, Autologous Chondrocyte Transplantation, Age, Matrix-Proteins

INTRODUCTION

Autologous chondrocyte transplantation (ACT) is a method for the repair of focal cartilage lesions in the knee based on the cultivation of chondrocytes *in vitro*. It consists of three stages: the harvesting and growth of chondrocytes in the laboratory, open-knee surgery for the implantation of the cultured cells, and the rehabilitation period [1, 2]. Therefore, the treatment outcome depends on a number of factors. Less favourable results were found in older patients [1]. The surgical and rehabilitation protocols were standardized for all the patients in the evaluation group, so that the factors influencing ACT outcome prior to surgery could be evaluated. Chondrocytes grown in culture were reported to express different patterns of matrix-protein synthesis [3]. These cells are also sometimes cryopreserved for delayed surgical implantation [2]. Our current study evaluates the influence on the clinical outcome after ACT of the patient's age, the *in vitro* synthesis of matrix-proteins by cultured chondrocytes, and the role of the eventual cryopreservation of the cells.

MATERIALS AND METHODS

The evaluation group consisted of 28 patients, treated more than a year ago with ACT for focal cartilage lesions of the femoral condyles. In the routine postoperative follow-up, we used four standard knee evaluation forms: ICRS Subjective, ICRS Surgeon's part, Lysholm and Cincinnati [4]. The overall treatment outcome was determined by combining the results from all four forms. It ranged from 16 (all scores excellent) to 4 (all poor) points. Matrix-protein synthesis categories were based on the ratios between the cartilage specific proteins aggrecan and collagen type II versus cartilage non-specific collagen type I production. Chondrocyte matrix-proteins were detected in cell culture supernatants by a dot-blot method, using specific antibodies [3]. Five categories were established, ranking from the best (1), with a high collagen II and aggrecan vs. low collagen I ratio, to the worst (5), with prevalent collagen I production. Correlations between the overall treatment outcome and the patients' age, the quality of matrix-protein synthesis and the effect of cell cryopreservation were assessed using an appropriate statistical program (SPSS).

RESULTS

No statistically significant correlation between the patients' age and the success of the ACT procedure was found (Fig 1). The same was observed for the impact of chondrocyte cryopreservation. The *in vitro* matrix-protein synthesis showed a correlation trend with the treatment outcome (Fig 2).

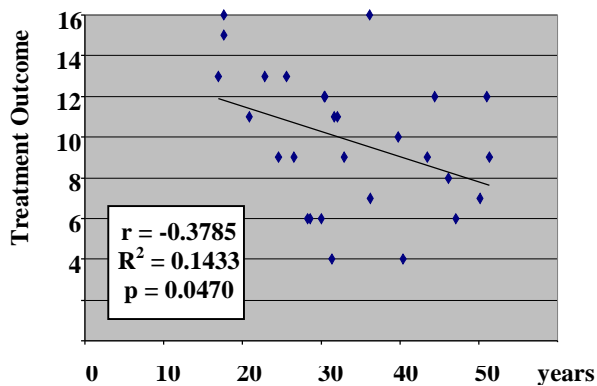


Fig. 1. Correlation between the patients' age and ACT outcome. (statistics at 95% confidence interval)

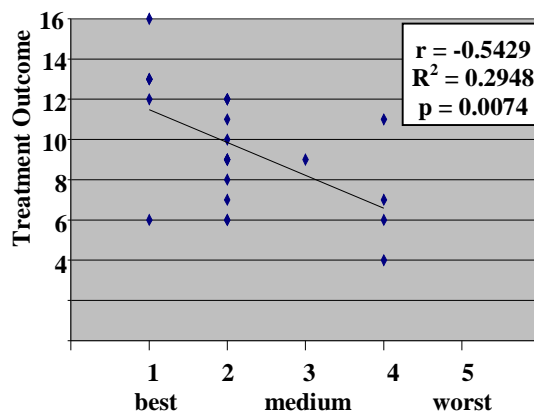


Fig. 2. Correlation between the matrix protein synthesis and ACT outcome. (statistics at 95% confidence interval)

DISCUSSION

While the age of the patients was not found to be predictive of the ACT success rate, the synthesis of chondrocyte matrix-proteins *in vitro* showed a tendency to correlate with the outcome of the ACT procedure. In order to confirm these preliminary results, higher numbers of patients and longer follow-up times are required.

REFERENCES

- Peterson, L., Minas, T., Brittberg, M., Nilsson, A., Sjogren-Jansson, E. and Lindhal, A. Two- to 9-year outcome after autologous chondrocyte transplantation of the knee. **Clin. Orthop.** 374 (2000) 212-234.
- Drobnič, M., Radosavljevič, D., Koritnik, B., Gorenšek, M., Kregar-Velikonja, N., Jeras, M. and Knežević, M. Five years of autologous chondrocyte transplantation (ACT) for the knee cartilage lesions. In: **Cartilage Weekend. The 2nd symposium of recent advances in cartilage repair and tissue engineering.** (Koritnik, B., Radosavljevič, D., Gorenšek, M. Eds.) Ljubljana: Orthopaedic Clinic, Clinical Centre. (2001) 48.
- Kregar Velikonja, N., Wozniak, G., Maličev, E., Jeras, M. and Knežević, M. Protein synthesis of human articular chondrocytes cultured *in vitro* for autologous transplantation. **Pflugers. Arch. Eur. J. Physiol.** 442 (2001) Suppl1 R169-R170.
- ICRS Comitee. The cartilage standard evaluation form/knee. **ICRS Newsletter** 1 (1998) 5-8.