

AUTOLOGOUS CHONDROCYTE IMPLANTATION IN THE KNEE JOINT: ARTHROTOMIC VS. ARTHROSCOPIC TECHNIQUE AT LONG TERM FOLLOW-UP

Ferruzzi A, Buda R, Timoncini A, Giannini S

Clinica Ortopedica, Istituti Ortopedici Rizzoli, Bologna, Italy

Introduction

Autologous Chondrocyte Implantation (ACI) in the knee joint has provided hyaline-like repair tissue, with satisfactory clinical and instrumental results in 80-90% of patients. The technique firstly required arthrotomic exposition of the joint, debridement of the lesions and suture of a periosteal flap to create a pocket to host the chondrocytes. In the recent past a three-dimensional hyaluronic acid scaffold was developed to support the autologous chondrocytes. Only a few studies compared arthrotomic with arthroscopic ACI, and those that do have short follow-up and limited and inhomogeneous case series. The aim of this study was to compare the long-term results in two groups of patients affected by osteochondral lesions in the knee joint treated with the two aforementioned procedures. Patients were evaluated clinically, histologically, and by MRI, with a minimum 6 year follow-up.

Methods

Between 1997 and 2002, were selected 98 patients affected by osteochondral lesions of femoral condyles of the knee, rated ICRS grade 3-4, $>2 \text{ cm}^2$ of size, with severely compromised articular function (objective IKDC score C or D), and aged between 18 and 45 years. Were excluded patients with osteochondral lesions $<2 \text{ cm}^2$, kissing lesions, patello-femoral or femoro-tibial misalignment, associated cruciate ligament lesions, infections or arthritis. 48 patients were treated by arthrotomic ACI and 50 by arthroscopic ACI. No statistical differences were observed in the 2 groups regarding gender, age, site, etiology, grade and size of the lesions. All 98 patients underwent clinical assessment before surgery and at 6, 12, 18 e 24 months postoperatively, then yearly, following the ICRS protocol. An MRI scan was performed on all the patients in the study pre-operatively and then at 6, 12, 24 months after implantation and at the final follow-up. Imaging sequences were carried out following the ICRS protocol for articular cartilage repair. After approval from the ethics committee and informed consent from the patients, the first 12 consecutive patients in the arthrotomic series and the first 10 in the arthroscopic series underwent a second-look arthroscopy and a biopsy 12 months after surgery.

Results

Both the arthrotomic and arthroscopic ACI series showed a better IKDC score at final follow-up compared to the pre-operative score (Wilcoxon $P < 0.0005$). Analysis of the arthrotomic ACI curve showed an improvement until 24 months. In the arthroscopic ACI curve, the increase was more rapid and remained stable after 18 months. A comparison of the data of the two series showed a significant difference at 12 months in favor of the arthroscopic ACI ($P = 0.0023$), while the findings at the other intervals were not significantly different. We had 9 complications in the arthrotomic ACI series and 2 in the arthroscopic ACI series. Eight patients (6 arthrotomic and 2 arthroscopic) underwent a surgical regularization of the graft 12 months after implantation, due to graft hypertrophy or delamination.

Statistical analysis of the data showed that complications were significantly lower in the arthroscopic ACI series (Mann-Whitney $P = 0.008$). The need for further surgery was also significantly lower in the arthroscopic ACI series (Mann-Whitney $P = 0.036$).

Discussion

Arthrotomic and arthroscopic ACI procedures provided satisfactory clinical and functional results at the long-term follow-up. From a statistical point of view no significant differences between the two series were found at the final follow-up. However, the achievement of stability was faster in the arthroscopic ACI group, as confirmed by the analysis of each curve (18 months vs 24 months). MRI confirmed that the cartilage regeneration was well integrated with the surrounding tissues in both the procedures.

One of the factors that can explain the better results obtained in the arthroscopic group is the use of the hyaluronic acid scaffold. This device, thanks to its adhesive properties, allows minimally-invasive implantation, thus avoiding the use of arthrotomy and a periosteal flap. The results are: reduced surgical trauma, better cosmetic results, and faster recovery. The lack of complications related to the graft healing, such as delamination or loose body formation in the arthroscopic group, may be well explained by the mechanical stability of the implant.