5-7  Chondrocytes versus fresh bone marrow implantation for cartilage repair - 3 year follow-up.

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Purpose: The aim of work was to analyze clinical effectiveness of fresh bone marrow and periosteum versus autologous chondrocytes in treatment of traumatic and degenerative cartilage defects.

Methods and Materials: There were 30 patients involved into this study, with mean age of 37 years. Patients were randomly operated with either chondrocytes or fresh bone marrow. Bone marrow was aspirated from iliac crest and implanted under the peristeum sutured over the defect. Chondrocytes were isolated, cultured, and implanted under collagen membrane. Patients followed same rehabilitation protocol. At 12, 24 and 36 months postoperatively, patients were evaluated with anatomic pain scale, Borttberg-Peterson VAS score, Lysholm and IKDC questionnaires. Patients were evaluated with MRI 3 and 12 and 24 months postoperatively. In 3 patients of each group tissue samples were obtained for histological assessment.

Results: After 36 months, 12 patients treated with bone marrow were classified as normal or nearly normal in IKDC examination form, and 2 as abnormal. All patients treated with chondrocytes were classified as normal. In both groups the MRI revealed both correct contour and continuity, without changes in subchondral bone in all but one patient treated with bone marrow. All histology samples revealed good cartilage-like regeneration.

Conclusions: In our opinion, there is need for introduction of biological therapies that avoid manipulations outside the surgical room, what would significantly reduce the costs and risk. In this study clinical results of bone marrow and periosteum combination in treatment of symptomatic, full thickness cartilage defects were compared with autologous chondrocytes implantation, without significant differences.

5.8  Year sequential clinical outcome improvement following autologous chondrocyte implantation

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Purpose: Autologous chondrocyte implantation is being increasingly used for symptomatic cartilage defects in the knee but durability of graft survival has been questioned. This prospective 7-year study reviewed and compared the clinical outcome of ACI. Results showed significant improvements in clinical rating scores compared to pre-operative levels (p<0.0001) with ongoing annual sequential improvement.

Methods and Materials: This prospective cohort study was conducted to evaluate articular cartilage repair using autologous chondrocyte implantation (ACI) performed within a single centre by a single surgeon with prior ethics approval being obtained. We present the clinical outcomes of 61 knees that have undergone autologous chondrocyte implantation since July 1998. Mean follow up was 39.4 months (range 12-72 months). The two stage operative technique involves implantation of chondrocytes, as a fluid cell suspension under a porcine biodegradable membrane(collagen I/II biomembrane). Patients were subsequently assessed on an annual basis using 7 independent validated clinical rating scores.

Results: Mean age at surgery was 32 years (15-51), 38 Males and 23 Females (M:F=1.7:1). Average size of defect was 3.19 cm2 (1 to 8.3). Modified Cincinnati (MCRS), Patient Functional Outcome and Lysholm & Gilchrist clinical rating scores all showed significant improvements compared to pre-operative levels (p<0.0001). Visual Analogue Score and Brittberg Functional rating score showed significant improvements compared to pre-operative levels (p<0.0001) with ongoing annual sequential improvement. Patient Rating and Brittberg scores, both subjective patient scores, similarly showed improvements.

Conclusions: ACI produces significant improvements in knee function when compared to pre-operative levels with continued sequential improvement in outcomes for up to seven years.

6.3  Evaluating knee function in patients treated with characterized chondrocyte implantation and microfracture, following an identical, standardized rehab protocol.

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Purpose: It may be expected that a two-step open surgery with characterized chondrocyte implantation (CCI) would be disadvantageous to the pace of knee function recovery compared to a one-step arthroscopic microfracture procedure. The objective was to assess the index knee function in patients following an identical, standardized rehab protocol, as part of a prospective randomized clinical trial comparing CCI to microfracture in treating symptomatic cartilage defects of the knee.

Methods and Materials: CCI (N=51) and microfracture (N=66) patients were assessed preoperatively and at 6, 9, and 12 months post operatively. Mobility (AOFAS), Anterior laxity (with KT1000), Isokinetic Strength (by peak torque at 60°) and Functionality (with a single hop, the crossover triple hop and timed hop test) were evaluated. Of 112 evaluable patients, 100 completed the mobility tests, 85 the functional tests, 75 the strength tests and 65 of the patients completed the anterior laxity tests. Completion rate was equally distributed.

Results: There were no significant differences in knee function between both treatment groups preoperatively. Also at 6, 9 and 12 months no significant differences were observed between treatment groups for all four tests, except at 9 months the difference for quadriceps strength for the microfracture group (Med =186) compared to the CCI group (Med = 144) was significant (p = 0.046). In general the knee function recovered at 12 months.

Conclusions: Under comparable rehabilitation conditions, the results demonstrate that the influence of the different surgical procedure was not significant on the function of the knee at 12 months.

6.4  Clinical and radiographic outcome following autologous chondrocyte implantation: comparison of traditional and accelerated approaches to post-operative rehabilitation.

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Purpose: Policies on post-operative load bearing rehabilitation following autologous chondrocyte implantation are varied and the subject remains controversial. We have compared an ‘accelerated’ weight bearing programme with a ‘traditional’ 12 week programme following matrix induced autologous chondrocyte implantation (MACI).

Methods and Materials: Fifty-eight patients with full-thickness medial or lateral femoral condyle defects participated in this randomized controlled trial. Following MACI, both rehabilitation interventions sought to protect the implant for an initial period, then incrementally increased the load over a 12-week period. Under the ‘accelerated’ protocol, patients reached full weight bearing at 6 weeks post surgery, compared to 11 weeks for the ‘traditional’ group. Clinical and radiographic outcomes were undertaken at three months post-surgery.

Results: Patients in the ‘accelerated’ group achieved greater six minute walk distances and daily activity levels as measured by accelerometer (p=0.05) compared to the ‘traditional’ group. Furthermore, the ‘accelerated’ group reported significantly better scores for the KOOS pain and symptoms subscales at 12-weeks (p<0.005), and there were no apparent adverse functional outcomes for this group. Regardless of the rehabilitation protocol employed, no patient suffered any adverse effect to the implant as assessed by MRI at 3 months.

Conclusions: The ‘accelerated’ load bearing approach that reduced the length of time spent ambulating on crutches was not detrimental to post-operative outcome, resulting in reduced knee pain, improved function and no graft complications. Patient follow-up is required to observe long-term graft outcomes.