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EVIDENCE-BASED ORTHOPAEDICS

AUTOLOGOUS CHONDROCYTE IMPLANTATION WAS SUPERIOR TO MOSAICPLASTY FOR REPAIR OF ARTICULAR CARTILAGE DEFECTS IN THE KNEE AT ONE YEAR

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A PROSPECTIVE, RANDOMISED COMPARISON OF AUTOLOGOUS CHONDROCYTE IMPLANTATION VERSUS MOSAICPLASTY FOR OSTEOCHONDRAL DEFECTS IN THE KNEE. J BONE JOINT SURG BR. 2003 MAR;85:223-30.

Question: In patients with articular cartilage defects in the knee, how effective is autologous chondrocyte implantation (ACI) compared with mosaicplasty?

Design: Randomized (unclear allocation concealment), unblinded, controlled trial with clinical and arthroscopic assessment at 1 year.

Setting: A hospital in Middlesex, United Kingdom.

Patients: 100 patients (mean age, 31.3 years; 57% men) with a symptomatic lesion of the articular cartilage in the knee (mean size of the defect, 4.66 cm^2) and persistent pain and reduction in activities. The mean duration of symptoms was 7.2 years, and 94 patients had had previous surgical intervention. Follow-up was complete.

Intervention: After arthroscopy to assess if the lesion was suitable for cartilage-grafting, patients were allocated to ACI (n = 58) or mosaicplasty (n = 42). In all patients, a longitudinal incision was made medial or lateral to the patella, and the articular cartilage at the edge of the defect was cut vertically. For mosaicplasty, 4.5-mm-diameter mosaic plugs taken from the margins of the trochlea or the intercondylar notch were used to fill the defect. For ACI, a fragment of articular cartilage (2 × 1 cm in size) was harvested from the margin of the trochlea, removed through a second portal, and treated with enzymic digestion to release cells. The cells were cultured in serum taken from the patient's blood at the time of surgery. 3 to 5 weeks later, the defect was covered with a piece of porcine collagen membrane or a piece of periosteum taken from the patient's tibia or femur and was secured with suturing and fibrin glue. The cultured cells (5 to 10 million cells) were then injected behind the membrane with a 1-mL syringe and a fine catheter. All patients followed identical postoperative and rehabilitation programs.

Main outcome measures: Clinical improvement at 1 year rated by the modified Cincinnati rating system and the Stanmore functional rating system: excellent (>80), good (55-79), fair (30-45), or poor (<30) on the Cincinnati rating. Improvement was defined as excellent or good results. Arthroscopy was used to assess the repair according to the 4-grade International Cartilage Research Society (ICRS) grading system.

Main results: At 1 year, more patients who received ACI had improvement than did patients who had mosaicplasty (P = 0.02 as calculated from data in article) (Table). Arthroscopic results were obtained only for 60 patients, but the results were excellent or good in more of the patients who received ACI than in those who had mosaicplasty (P < 0.01) (Table).

Conclusions: In patients with articular cartilage defects in the knee, autologous chondrocyte implantation resulted in greater clinical improvement than did mosaicplasty at 1 year.

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Autologous chondrocyte implantation (ACI) compared with mosaicplasty for articular cartilage defects in the knee*

Outcome at 1 Year	ACI	Mosaicplasty	RBI (95% CI)	NNT (95% CI)
Clinical improvement	88%	69%	27% (8.9 to 65)	6 (3 to 35)
Arthroscopic improvement†	82%	35%	133% (41 to 338)	3 (2 to 5)

*RBI = relative benefit increase; CI = confidence interval; NNT = number needed to treat. (Both the CI and the NNT were calculated from data in article.) †Outcome reported for 60 patients.

Commentary

Bentley and colleagues report the results of a 1-year randomized prospective trial of patients who underwent either ACI or autogenous osteocartilaginous transfer with 4.5-mm-diameter plugs.

Several issues affect the interpretation of this study and its potential application to clinical practice. First, the length of clinical follow-up (12 months) was probably insufficient. For example, 50% of patients in the ACI group were noted to have soft cartilage on probing. Although Peterson and colleagues[1] reported that patients with durable ACI grafts had stiffness measurements within 90% of the surrounding native articular cartilage, whether soft ACI grafts go on to a more resilient tissue or are unable to sustain loads and degrade over time is a question that can only be answered with further follow-up. Second, because animal studies have shown that prominent, compared with flush, mosaicplasty grafts result in micromotion, graft fibrillation, and poor osseous incorporation[2], part of the reason for the poor arthroscopic appearance in this study may have been graft prominence. Third, small graft size (4.5 mm) may have resulted in poor incorporation between the grafts, with fragmentation in high-stress weight-bearing areas. Fourth, the authors had full weight-bearing initiated at 24 hours after the operation, which also could have affected the incorporation of the slightly prominent osteochondral plugs. Finally, the authors do not comment on malalignment, which if not corrected, may place patients at risk for failure.

The results of this study differ from those of another recently published prospective clinical trial that showed no significant difference between autogenous cartilage plug transfers and ACI at 2 years of follow-up[3].

Further study with a minimum follow-up of 5 years as well as a complete and thorough histologic analysis is needed to determine which technique, ACI or autogenous osteocartilaginous transfer, is best.

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