Adipose-Derived Mesenchymal Stem Cells With Microfracture Versus Microfracture Alone: 2-Year Follow-up of a Prospective Randomized Trial.

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Abstract:

PURPOSE: To compare the clinical and radiologic efficacy of adipose-derived stem cells (ADSCs) with fibrin glue and microfracture (MFX) versus MFX alone in patients with symptomatic knee cartilage defects.

METHODS: Patients who were aged 18 to 50 years and had a single International Cartilage Repair Society grade III/IV symptomatic cartilage defect (>=3 cm(2)) on the femoral condyle were randomized to receive ADSCs with fibrin glue and MFX treatment (group 1, n = 40) or MFX treatment alone (group 2, n = 40). There was a lack of blinding for patients because of the additional intervention method (liposuction). The cartilage defect was diagnosed using preoperative magnetic resonance imaging (MRI), and quantitative and qualitative assessments of the repair tissue were carried out at 24 months by using the Magnetic Resonance Observation of Cartilage Repair Tissue scoring system with follow-up MRI. Clinical results were evaluated using the Lysholm score, the Knee Injury and Osteoarthritis Outcome Score (KOOS), and a 10-point visual analog scale for pain (0 points, no pain; 10 points, worst possible pain) preoperatively and postoperatively at 3 months, 12 months, and the last follow-up visit.

RESULTS: The 2 groups had similar baseline patient characteristics. Follow-up MRI was performed at 24 months (mean, 24.3 months; range, 24.0 to 25.1 months) after the operation. Group 1 included

26 patients (65%) who had complete cartilage coverage of the lesion at follow-up compared with 18 patients (45%) in group 2. Significantly better signal intensity was observed for the repair tissue in group 1, with 32 patients (80%) having normal or nearly normal signal intensity (i.e., complete cartilage coverage of the lesion) compared with 28 patients (72.5%) in group 2. The mean clinical follow-up period was 27.4 months (range, 26 to 30 months). The improvements in the mean KOOS pain and symptom subscores were significantly greater at follow-up in group 1 than in group 2 (pain, 36.6 +/- 11.9 in group 1 and 30.1 +/- 14.7 in group 2 [P = .034]; symptoms, 32.3 +/- 7.2 in group 1 and 27.8 +/- 6.8 in group 2 [P = .005]). However, the improvements in the other subscores were not significantly different between group 1 and group 2 (activities of daily living, 38.5 +/- 12.8 and 37.6 +/- 12.9, respectively [P = .767]; sports and recreation, 33.9 +/- 10.3 and 31.6 +/- 11.0, respectively [P = .338]; quality of life, 38.4 +/- 13.1 and 37.8 +/- 12.0, respectively [P = .650]). Among the 80 patients, second-look arthroscopies were performed in 57 knees (30 in group 1 and 27 in group 2), and biopsy procedures were performed during these arthroscopies for 18 patients in group 1 and 16 patients in group 2. The second-look arthroscopies showed good repair tissue quality, although no significant intergroup difference was observed. The mean total histologic score was 1,054 for group 1 compared with 967 for group 2 (P = .036). Age, lesion size, duration of symptoms before surgery, mechanism of injury, and combined procedures were not correlated with clinical results, Magnetic Resonance Observation of Cartilage Repair Tissue scores, and histologic outcomes at short-term follow-up.

CONCLUSIONS: Compared with MFX alone, MFX and ADSCs with fibrin glue provided radiologic and KOOS pain and symptom subscore improvements, with no differences in activity, sports, or quality-of-life subscores, in symptomatic single cartilage defects of the knee that were 3 cm(2) or larger, with similar structural repair tissue.

LEVEL OF EVIDENCE: Level II, prospective comparative study.