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Osteochondral autograft transplantation for isolated patellofemoral osteoarthritis

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ABSTRACT

Background: The purpose of this retrospective study was to evaluate clinical outcomes of osteochondral autograft transplantation (OAT) for isolated patellofemoral (PF) osteoarthritis (OA).
Methods: OAT was performed in seven patients (six men, one woman; mean age, 61.1 years) with isolated PF OA. The mean duration of follow up was 46.9 months (range, 24–84 months). Clinical outcomes were evaluated preoperatively and postoperatively according to the International Knee Documentation Committee (IKDC) objective score and the knee scoring system of the Japanese Orthopaedic Association (JOA) score. The International Cartilage Repair Society (ICRS) score was recorded in three cases that underwent second-look arthroscopies postoperatively. For morphological evaluation, the Kellgren and Lawrence (KL) classification and the modified magnetic resonance observation of cartilage repair tissue (MOCART) score were used.
Results: The mean IKDC and JOA scores were both significantly improved. The percentage of normal and nearly normal on the IKDC score was increased from 28.6% (2/7) to 85.7% (6/7) ($P = 0.05$). The mean JOA score was improved from 80.0 (range, 65.0–85.0) to 95.0 (range, 90.0–100) ($P = 0.0008$). The mean ICRS scores were 10.3 (nearly normal) in the three cases that underwent second-look arthroscopies postoperatively. Regarding KL classification, the grade was unchanged in five cases (two cases in grade 1, three cases in grade 2) and improved in two cases (from grade 3 to 2, from grade 4 to 3). The mean modified MOCART score was 67.9 (range, 60.0–75) at 12-month follow up. There were no complications, and satisfaction was obtained in all cases. The study design was case series: level IV.
Conclusions: All clinical scores improved significantly postoperatively. Osteochondral plugs were transplanted perpendicular to the articular surface to obtain good congruity of the repaired articular surface. In this way, OAT is an effective procedure to prevent progression of isolated PF OA.

1. Introduction

Isolated patellofemoral (PF) osteoarthritis (OA) is a difficult clinical challenge. The ideal of cartilage repair in the osteoarthritic population over 40 years of age lies in addressing the whole joint organ, rather than the cartilage lesion alone. Focal cartilage (one to four square centimeters) repair can be successful in lesions of OA [1]. Hangody et al. documented the results of osteochondral autograft transplantation (OAT) as a salvage intervention in 82 athletes with OA of the knee, showing a lower but still significant improvement and evidence of further radiographic degeneration in one-third of the patients at mid- to long-term follow up [2].

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Therefore, focal chondral lesions presenting in the setting of OA can be addressed with OAT, but results on the use of OAT for treatment of lesions in OA knees are less clear, with only a few reports [3].

Meanwhile, isolated PF OA occurs in nine percent of the patients over 40 years of age [4] and has also been associated with symptoms of pain, stiffness, and functional limitation [5]. Chondral lesions of the PF joint can be especially challenging to treat successfully, due to the complex biomechanical environment present and the significant forces experienced within this compartment during weight-bearing activity [6]. Although little consensus has been established as to the best way to approach treating PF lesions with OAT, the technique remains a viable option for smaller lesions with involvement of the underlying subchondral bone [6,7]; there is still no gold standard for the treatment of isolated PF OA, and its optimal treatment is unclear at present [8,9].

We hypothesized that OAT in patients with isolated PF OA would demonstrate satisfactory clinical results at short- to mid-term follow up independent of lesion size, location, or number of plugs required. The purpose of this retrospective study was to present clinical outcomes of OAT for isolated PF OA. The primary outcome measures were the postoperative International Knee Documentation Committee (IKDC) objective score and the knee scoring system of the Japanese Orthopaedic Association (JOA) score.

2. Materials & methods

All procedures were reviewed and approved by the research ethics committee of our hospital. The cases were seven patients (six men, one woman) with isolated PF OA who underwent surgery during the 4 years between January 2008 and January 2012. A retrospective review was performed of all surgical procedures performed at our two related institutions by a single surgeon. The mean operative age was 61.1 years (range, 47–74 years). The mean duration of follow up was 46.9 months (range, 24–84 months). The inclusion criteria in the study were: isolated osteoarthritic lesion of the PF joint at stage 3 or 4 according to the International Cartilage Repair Society (ICRS) classification system [10]; femoral-tibial angle within the normal range; and no trochlear dysplasia. Regarding the alignment of the PF joint, the mean Insall–Salvati ratio, tibial tubercle to trochlear groove (TT–TG) distance and patella tilting angle were considered normal (0.98 (range, 0.95–1.03), 10.7 mm (range, 9.4–13.2 mm), and 4.3° (range, 3.5–5.3°), respectively). Therefore, no concomitant procedures, such as lateral retinacular release or tibial tuberosity transfer, were performed at the same time. Moreover, only cases that had been treated with conservative measures (such as analgesia, weight loss, modification of activity, and a knee exercise program) for more than three months before surgery were included in the study.

Preoperatively, knee radiographs were evaluated, the extent of the osteochondral lesion was assessed by magnetic resonance imaging (T1- and T2-weighted images), and whether surgery was indicated was finally determined by arthroscopy. Long-leg weight-bearing alignment X-ray views were included in cases with obvious abnormal alignment.

All operations were performed by a single surgeon using the OATS (Arthrex, Naples, FL). OAT was performed by the open approach using the medial para-patellar approach in all cases. Osteochondral grafts were transplanted from non-weight-bearing areas (about 10 mm from the lateral or medial edges of the trochlea) to weight-bearing areas. To obtain a smooth surface, osteochondral plugs were transplanted perpendicular to the articular surface of the trochlea (Figure 1). Continuous passive motion of the knee was started from the third postoperative day after removal of the drain tube. Partial one-third weight-bearing was allowed at the third week, weight-bearing was then gradually increased step by step, and full weight-bearing was allowed at the sixth week after surgery. Running exercise was allowed in the third month.

Clinical status was evaluated preoperatively and at the final follow up according to the International Knee Documentation Committee (IKDC) objective score and the knee scoring system of the JOA [11]. The JOA score evaluates four items: ability to walk (30 points), ability to climb up and down stairs (25 points), range of motion (35 points), and joint swelling (10 points). Each knee joint can achieve a maximum score of 100 points on the JOA scale. A validation study for the JOA score was reported by Okuda et al. [12]. The JOA score was significantly correlated with validated patient-rated outcome measures (Japanese Knee Osteoarthritis Measure, 36-Item Short Form Health Survey), indicating concurrent validity of the JOA. Moreover, the mean range of motion (ROM) and the ability to sit straight in Japanese style (seiza) were recorded. For morphological evaluation, the Kellgren and Lawrence (KL) classification [13] and the modified magnetic resonance observation of cartilage repair tissue (MOCART) score [14] were used. The ICRS cartilage repair assessment score [10] was recorded in three cases that underwent second-look arthroscopies postoperatively. The mean postoperative period from OAT to second-look arthroscopy was 20 months (range, 13–33 months). The assessment of donor site morbidity was based on the patella compression test and the complaint of anterior knee pain.

Patients' characteristics, including sex, age, location of osteochondral lesions of the PF joint, lesion size, number of harvested plugs, and diameter of harvested plugs, were recorded (Table 1). The above-mentioned factors were analyzed to determine whether they had any effects on postoperative clinical scores. Statistical analyses were performed using SPSS version 20.0 (IBM, Armonk, NY, USA). The independent *t*-test, the Mann–Whitney *U*-test, and Fisher's exact test were used to search for possible factors associated with postoperative clinical scores. Significance was defined as $P < 0.05$.

This study was approved by the institutional review board.

3. Results

All seven patients had both trochlear and patellar lesions. The mean lesion size was 295.0 mm^2 (range, 100–750 mm^2). The mean number and diameter of harvested plugs were 3.1 (range, 2.0–4.0) and 8.1 mm (range, 7.0–9.0 mm), respectively

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