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## Thirty-eight-year outcome of osteochondral autograft transplantation in the knee joint: A case report

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### Abstract

In 1985, we reported two cases of osteochondral autograft transplantation with the goal of repairing osteochondral defects in the knee joints of patients with osteochondritis dissecans using hyaline cartilage. Since then, osteochondral autograft transplantation, mosaicplasty, autologous chondrocyte transplantation, and allogeneic osteochondral transplantation have been developed and implemented as treatments for osteochondral defects. However, the long-term outcomes of these treatment modalities have not been hitherto reported.

The patient was a 21-year-old man. He had medial extended type left knee joint osteochondritis dissecans. Osteochondral autograft transplantation was performed in 1980. A piece of osteochondral autograft was collected from the medial side of the trochlea and transplanted to the crater. Cancellous bone with cortical bone was transplanted from the ilium to the osteochondral collection site.

There were neither subjective symptoms nor abnormal objective findings in the knee 38 years after. Radiographs showed small osteophytes in the medial tibiofemoral joint, and the patella skyline view showed narrowing of the medial patellofemoral joint space. On computed tomography, the bony part of the transplanted osteochondral autograft was fused with the surrounding bone tissue, and the trabecular pattern was similar to that of the original bone. A coronal section of a magnetic resonance imaging scan showed that the signal intensity of the transplanted cartilage was similar to that of the adjacent native cartilage. In the patellofemoral joint, the cartilage of the medial facet of the patella and trochlea was uneven.

We reported 38-year outcomes in a patient who underwent osteochondral autograft transplantation in the knee joint. There were neither subjective symptoms nor abnormal objective findings in the knee. Imaging findings showed that a piece of osteochondral autograft filled the crater in the femoral condyle, and the superficial cartilage was considered to be alive.

**Keywords:** Osteochondritis dissecans, osteochondral defect, osteochondral autograft transplantation, long-term outcomes

### Introduction

In 1985, we reported two cases of osteochondral autograft transplantation (OAT) with the goal of repairing osteochondral defects in the knee joints of patients with osteochondritis dissecans (OCD) using hyaline cartilage [1]. Since then, OAT, mosaicplasty (osteochondral autologous plug techniques), autologous chondrocyte transplantation, and allogeneic osteochondral transplantation have been developed and implemented as treatments for large osteochondral defects [2, 3, 4]. However, the long-term outcomes of these treatment modalities have not been hitherto reported [3, 4].

At the time of surgery, it was uncertain whether the patients could acquire and maintain satisfactory functions of a transplanted osteochondral autograft for a long period of time.

However, the patient in one of the two reported cases has not experienced adverse knee joint symptoms for the 38 years. Herein, we report the clinical features and imaging findings of a 59-year-old man who had undergone OAT. The patient in the other case report could not be followed up, because he moved to a distant place about 9 years after the surgery and lost communication.

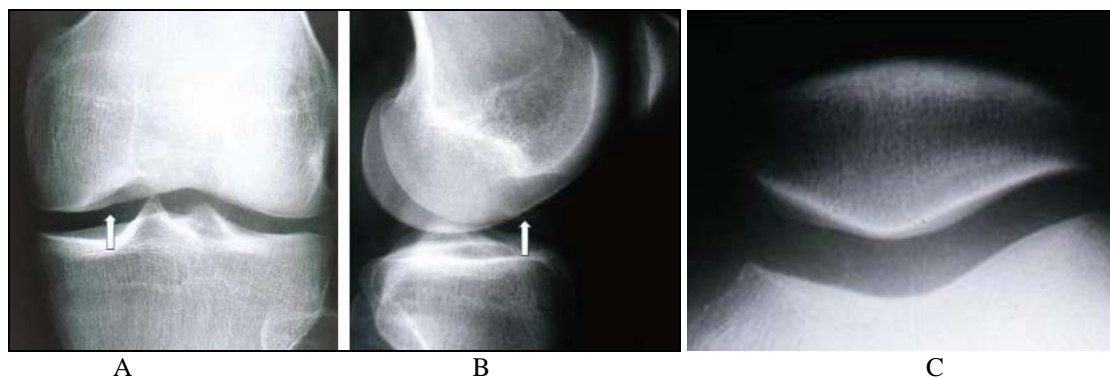
### Case Report

The patient was a 21-year-old man whose case has been reported as the second case in a previously published article [1]. He had medial extended type left knee joint OCD (Fig. 1).

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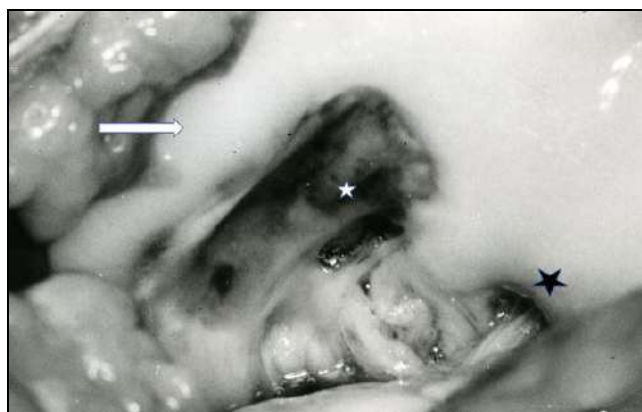
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**Fig 1:** Preoperative radiograph. A; standing anterior-posterior view, B; lateral view, C; 60° skyline view. White arrow; OCD.

The osteochondral defect measured  $28 \times 20 \times 7$  mm (length  $\times$  width  $\times$  depth) and extended anteroposteriorly from the center of the medial femoral condyle (MFC) to the intercondylar fossa (Fig. 2). OAT was performed in 1980.



**Fig 2:** Osteochondral defect of the medial femoral condyle of left knee joint. White arrow; medial femoral condyle, ☆; crater, ★; intercondylar fossa.

A piece of osteochondral autograft, which was the largest size that could be collected and was close to the size of the defect, was collected from the medial side of the left femoral trochlea and transplanted to the crater of MFC. The transplant was slightly smaller in width than the crater. Cancellous bone with cortical bone was transplanted from the ilium to the osteochondral collection site and fixed with a screw.

#### Postoperative course

He graduated from college, a high school teacher; at the

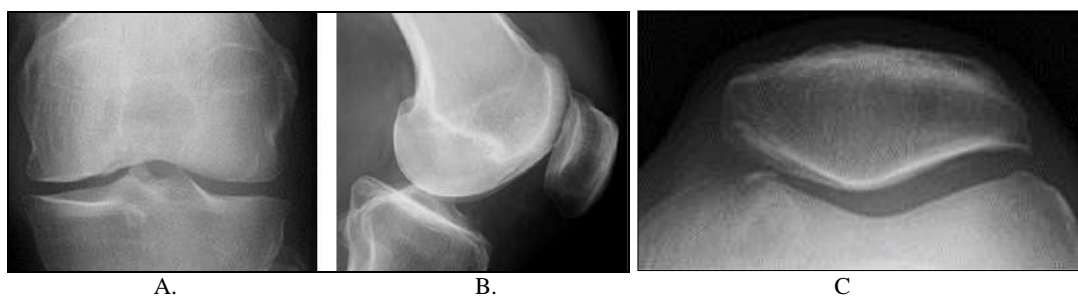
time this case report was written, he was still in the teaching profession.

Ten years after OAT, he faced no problems with activities of daily living; moreover, he enjoyed playing tennis, skiing, and other sports for recreation. Patellofemoral crepitus, patellofemoral compression pain, and thigh circumference laterality were absent. On lateral radiographs 10 years after the operation, a slight depression of the transplanted section was observed without any postoperative changes. No arthropathic changes were observed in the patellofemoral and tibiofemoral joints.

Thirty-eight years after transplantation, he had no symptoms in his left knee joint and continued playing tennis and skiing recreationally as before. He had not experienced any pain, swelling, heat sensation, or other adverse symptoms in his knees up till the time of writing of this report; moreover, he had not suffered major trauma. There was no swelling, warmth, or tenderness of the left knee joint. No patellar hypermobility, trochlear tenderness, patellofemoral compression pain, or retropatellar pain were observed; moreover, there were no signs of meniscal injury or ligament instability in the knee. In addition, there was no difference in the range of motion between the left and right knee joints, and he was able to sit upright in the Japanese style.

#### Imaging findings 38 years after OAT

Standing anteroposterior radiographs showed small osteophytes in the medial tibiofemoral joint, and the 60° patella skyline view showed a slight narrowing of the medial patellofemoral joint space, osteochondral defect and surface irregularities of the medial edge of the trochlea. Chondrocalcinosis was not observed (Fig. 3). No abnormal findings were found in the contralateral knee.



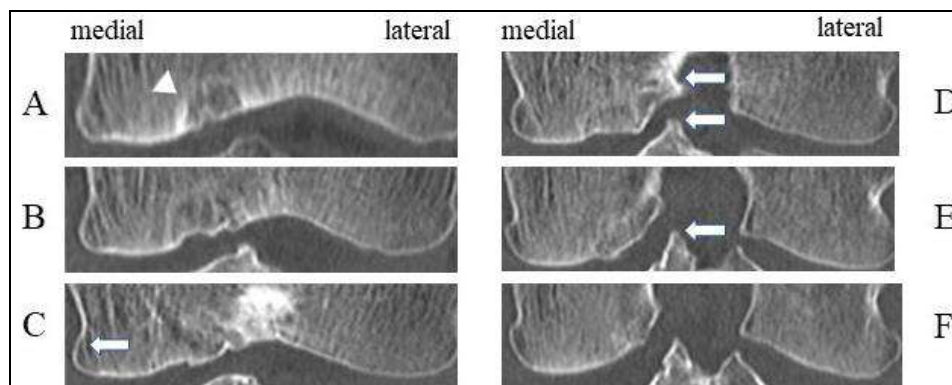
**Fig 3:** Plain radiograph 38 years after the operation. A; standing anterior-posterior view, B; lateral view, C; 60° skyline view.

On computed tomography (CT), the border of the transplanted bone could be identified by a pale white line (Fig. 4). The bony part of the transplanted osteochondral

autograft was fused with the surrounding bone tissue, and the trabecular pattern was similar to that of the original bone tissue trabecula. The X-ray permeability of the transplanted

subchondral bone was slightly enhanced in the anterior part of the transplanted bone (Fig. 4-A, B). In the posterior part of the transplanted bone, a part of the bone bulged, and the subchondral bone surface was irregular, but it was relatively

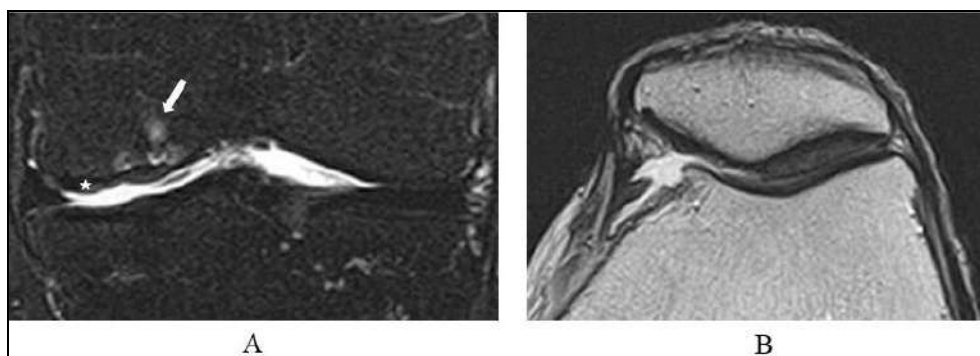
smoothly continuous with the original subchondral bone (Figs. 4-D, E). The central part of the transplanted bone was slightly recessed (Fig. 4-B). A small osteophyte was found in the medial condyle of the tibia and tibial spine (Fig. 4-D-F).



**Fig 4:** Frontal section of the left distal femoral condyle from anterior (A) to posterior (F) of computed tomography 38 years after surgery. White arrowhead in Fig. 4A; a site of osteochondral autograft. White arrows in Fig. 4C, D, and E; osteophytes.

Figure 5-A shows a coronal section of a magnetic resonance imaging (MRI) scan (1.5 T) around the center of the osteochondral transplant of the femur. The signal intensity of the transplanted cartilage was similar to that of the adjacent native cartilage. The cartilage surface in the transplanted part of the MFC was uneven. A shallow fissure was present in the grafted cartilage layer at a previous section of this coronal image. Diffuse subchondral edema-

like bone marrow signal intensity <sup>[2]</sup> was present in the bulged subchondral bone, which was part of the transplanted osteochondral tissue (Fig. 5-A). Mild surface irregularities were also found in the cartilage of the medial tibial condyle. In the patellofemoral joint, the medial part of the trochlea was smaller, and the cartilage of the medial facet of the patella and trochlea was uneven (Fig. 5-B).



**Fig 5:** Magnetic resonance image of the left knee joint 38 years after surgery. A; coronal T2 weighted fat-suppressed image, B; transverse T2 gradient-echo image. White arrows in Figure 5A; subchondral edema-like bone marrow signal, ☆; native cartilage layer of medial femoral condyle between the fluid (white signal) and the subchondral bone.

No medial and lateral meniscal tears were observed, with no damage to the anterior cruciate, posterior cruciate, medial collateral and lateral collateral ligaments.

### Discussion

OCD with large defect can cause knee osteoarthritis at an early stage, if left untreated <sup>[3]</sup>. In 1985, we described a method for collecting osteochondral bone from the trochlea and transplanting it into the crater for the treatment of osteochondral defects in a patient with OCD <sup>[1]</sup>.

In the long-term course of this patient, there were neither clinically subjective symptoms nor objective abnormal findings. Plain radiographs showed mild osteoarthritic changes compared to those in contralateral radiographs. Those osteoarthritic changes were classified as grade 2 according to the Kellgren-Laurence classification <sup>[5]</sup>.

CT and MRI findings revealed abnormalities after OAT. CT showed a step on the surface of the transplanted bone and

the surrounding normal subchondral bone; this step remained for a long time without undergoing remodeling (Fig. 4, 5). Therefore, it is thought that the state where the step remained on the cartilage surface, that is, the local incompatibility of the joint surface, continued. Moreover, this was thought to be the cause of the mirror change of the opposing tibial articular surface (Fig. 5). This image of the osteochondral autograft was considered a degenerative finding. However, the signal intensity of the transplanted cartilage was similar to that of the adjacent native cartilage, and a piece of osteochondral autograft covered completely filled the crater.

At present, the imaging findings of cartilage and subchondral bone are confined to the osteochondral transplantation site; however, the abovementioned degeneration can possibly spread to the surrounding area in the future. It is presumed that in the osteochondral collection part of the trochlea, the transplanted ilium did not

match the shape of the trochlea, and thus the contact surface with the patella became smaller and degenerative changes occurred in the patellofemoral joint.

Because the MRI instrument used a 1.5T imaging installation, we believe it was insufficient to evaluate the cartilage only. In the future, a more detailed evaluation using 3T-MRI T2-weighted mapping should be performed [2-4]. There were neither subjective symptoms nor objective findings; hence, arthroscopy could not be performed. If symptoms occur, knee joint arthroscopy will be performed.

### Conclusion

We reported 38-year outcomes in a patient who underwent OAT in the knee joint. There were neither subjective symptoms nor abnormal objective findings in the knee. Plain radiography showed mild osteoarthritic changes compared to the contralateral side. CT showed surface irregularities of the subchondral bone and almost the same trabecular pattern as that of the original bone. MRI showed that the signal intensity of the transplanted cartilage was similar to that of the adjacent native cartilage. Mild surface irregularities were found in the cartilage of the medial femoral and tibial condyles. The osteochondral margin of the trochlea should have been left when collecting the large graft from the trochlea. Further long-term follow-up is required.

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**Conflict of Interest:** none

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