INTRODUCTION

Treatment for early-stage osteochondritis dissecans (OCD) of the elbow is principally nonsurgical. Consequently, patients cannot return to their sports activities for at least 1 year.\(^1\) If conservative treatment fails, the patient may undergo surgery as the next step. If patients desire an early return to their pre-injury activity levels and their lesion is at an advanced stage, osteochondral autograft appears to be one of several promising options.\(^2\) We retrospectively studied nine young athletes who used an elbow brace postoperatively and returned to playing baseball within 6 months of osteochondral autograft.

PATIENTS AND METHODS

We retrospectively reviewed the cases of nine young athletes who consecutively underwent osteochondral autograft in our institute for an advanced OCD lesion of the humeral capitellum. All patients were boys with a mean age of 13.7...
years (range, 12–15 years). The growth plate of the capitellum was closed in four patients and open in five patients. All patients regularly played baseball in their school teams and all experienced elbow pain from sports activity.

During surgery, the lateral collateral ligament was divided once to expose the osteochondral lesion in the capitellum. After debridement of the lesion, one or two cylindrical osteochondral bone plugs (diameter, 6.5 or 8.5 mm) were transferred from a lateral femoral condyle. Osteochondral autograft was performed using the Osteochondral Autograft Transfer System (OATS, Arthrex Inc., Naples, FL, USA) and press-fit fixation was obtained. After surgery, the elbow was immobilized in a plaster splint for 2 weeks. Then, active range-of-motion exercises using an elbow brace with a hinge (Nakamura Brace Inc., Ohda, Shimane, Japan) (Fig. 1) and muscle-strengthening exercises were carried out for 2–3 months. Patients continued to wear the elbow brace for 2 months postoperatively. At 3 months after surgery, patients were instructed to remove the brace and start throwing a ball. Patients could return to playing baseball at around 6 months after surgery.

Patients were followed up for a mean duration of 21.1 months (range, 12–36 months). Evaluation was done in terms of elbow function and radiographic and magnetic resonance imaging (MRI) findings. Elbow function was assessed using the Japanese Orthopaedic Association (JOA) elbow score (total 100 points), which consists of items such as pain, function, range of motion, instability, and deformity.

The Wilcoxon signed-rank test in StatView ver. 5.0 (SAS Institute Inc., Cary, NC, USA) was used for the comparison of clinical evaluation scores, and $P < 0.05$ was regarded as statistically significant.

Written informed consent was obtained from all the patients. This study was conducted in accordance with the World Medical Association Declaration of Helsinki.

### RESULTS

All patients had early functional recovery and were able to return to their former sports activities. The mean duration from the surgery to the first participation in a baseball game was $5.8 \pm 0.8$ months (range, 4–7 months). The mean JOA elbow score was $68.0 \pm 16.2$ points before surgery; however, the score had significantly improved to $98.7 \pm 2.7$ points at 1 year after surgery ($P = 0.001$), and was $98.7 \pm 2.7$ points at the final follow-up ($P = 0.001$).

All patients achieved bony union radiologically within 3 months. MRI confirmed congruity of the articular cartilage at 1 year after surgery (Fig. 2). All patients returned to their pre-injury activities and were satisfied with their final outcomes.

### DISCUSSION

Treatment for early-stage OCD of the elbow is principally nonsurgical, so that the patients usually cannot return to their sports activities for at least 1 year. If conservative treatment failed, patients may undergo surgery as the next step. In such cases, patients have to spend a much longer time in recovery and may lose the chance for further participation in school sports.
If a patient desires an early return to their pre-injury activity level by means of surgery and their lesion is an advanced stage, osteochondral autograft appears to be one of several promising options for OCD. In our series, all patients returned to their baseball team and played in games within 4–7 months after their operation. They were pleased to be able to complete their baseball club activities in the remaining time of their school lives. We believe that osteochondral graft is a promising and reliable treatment in patients with advanced OCD who desire an early return to their pre-injury sports activities.

There are many reports of good results of osteochondral grafting for OCD of the elbow. Shimada et al. reported excellent results in 80% of their patients, and Iwasaki et al. showed that 94.4% of their patients had good or excellent outcomes and 88.9% returned to sports activities. Neither group mentioned the use of the elbow brace in their reports. Lyons et al. reported better clinical outcomes in adolescent athletes, with a 100% return rate to former sports activities. Lyons et al. used a hinged elbow brace for 4 weeks, following immobilization in a long arm splint for 2 weeks postoperatively. In their postoperative rehabilitation program, patients removed the elbow brace at 6 weeks postoperatively, and strengthening and throwing exercises were not initiated until 3 months after surgery. Patients returned to playing sports at 4.4 months on average and were greatly satisfied with the results. In our study, the mean duration from the surgery to the first participation in a baseball game was 5.8 ± 0.8 months (range, 4–7 months). Our results were comparable to the outcomes demonstrated by Lyons et al. To our knowledge, there are few reports describing the use of an elbow brace for postoperative rehabilitation of OCD. The advantage of using an elbow brace is the prevention of valgus/varus stress.

**Fig. 2.** (A) Preoperative X-ray demonstrated an osteochondral lesion in the capitellum of a 15-year-old boy (arrowheads). (B) Proton density-weighted MRI indicated an osteochondral lesion with a high-intensity signal (arrows). (C) Nine months postoperatively, an X-ray image demonstrated remodeling of the osteochondral graft in the capitellum. (D) Nine months postoperatively, MRI indicated a smooth articular surface and incorporation of the graft into the host bone.
on the elbow. During surgery, the lateral collateral ligament is divided once to expose the osteochondral lesion, and the ligament is repaired meticulously after implantation. The elbow brace may interfere with normal screw displacement as well as valgus/varus movement of the elbow joint. Bottlang et al.\(^7\) stated that the screw displacement axis varied over a relatively small range. For practical purposes, wearing an elbow brace protects the collateral ligament as well as the osteochondral graft from excess stress during rehabilitation. Gentle range-of-motion exercises with the elbow brace also promote ligament healing\(^8\) and remodeling of articular cartilage.\(^9\)

In an experimental study of osteochondral grafting in the treatment of OCD using sheep knees,\(^10\) osteochondral autografts healed and showed good maintenance of the joint surface. Despite good healing in the short term, microscopic examination revealed a small cleft between the osteochondral plug and the host cartilage. This incomplete healing might lead to osteoarthritic change in the long term. Controlled postoperative rehabilitation using an elbow brace improved the clinical results in our series.

One limitation of the present study was the small number of patients. However, we conducted regular examinations in consecutive patients until they returned to their sports activities; we thereby obtained results supporting the effectiveness of the elbow brace. Another limitation is the absence of a control group. However, it is evident that postoperative rehabilitation using an elbow brace causes no harm and seems to be clinically effective. Therefore, it seemed ethically appropriate not to set up a control group.

This study revealed that osteochondral autograft with postoperative rehabilitation using an elbow brace may be a reasonable treatment for young athletes with advanced OCD lesions of the elbow who desire an early return to their pre-injury sports activity levels.

### CONFLICT OF INTERESTS

The authors declare that there are no conflict of interests.

### REFERENCES