American Journal of Case Reports

e-ISSN 1941-5923
© Am J Case Rep, 2026; 27: e955010
DOI: 10.12659/AJCR.955010

Received: 2026.07.31
Accepted: 2026.10.27
Available online: 2026.10.30
Published: 2026.XX.XX

Fresh Osteochondral Allograft Transplantation as a Salvage Procedure Following Failed Fixation of Osteochondritis Dissecans of the Lateral Femoral Condyle: A Case Report

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Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Financial support: None declared
Conflict of interest: None declared

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Patient: Female, 19-year-old
Final Diagnosis: Osteochondritis dissecans of the left lateral femoral condyle
Symptoms: Pain • Recurrent mechanical locking
Clinical Procedure: —
Specialty: Orthopedics and Traumatology • Sports Medicine

Objective: Unusual clinical course

Background: Osteochondritis dissecans (OCD) of the knee can progress to large osteochondral defects when fragment fixation fails, representing a reconstructive challenge in young active patients. Fresh osteochondral allograft transplantation (OCA) restores both the viable hyaline cartilage and subchondral bone and has emerged as a joint-preserving treatment for these lesions. However, reports describing OCA as a salvage procedure after failed OCD fixation remain limited.

Case Report: A 19-year-old female patient who participated in competitive sports presented with recurrent pain and mechanical locking of the left knee after previous fixation of an OCD lesion of the lateral femoral condyle. Imaging demonstrated fixation failure, retained hardware, loose bodies, and an osteochondral defect measuring 25 × 12 mm. Open removal of the failed fixation and loose bodies was followed by fresh size-matched OCA using a press-fit technique. At the 24-month follow-up, the patient had returned to high-level athletic activity without mechanical symptoms. Clinical examination demonstrated functional range of motion and adequate quadriceps strength. The International Knee Documentation Committee subjective score was 93/100, and the Tegner Activity Scale score was 7, compared with a preinjury score of 8. Magnetic resonance imaging confirmed satisfactory graft incorporation without graft-related complications.

Conclusions: Fresh OCA may be considered as a joint-preserving salvage option after failed OCD fixation in carefully selected young patients. In this case, satisfactory graft incorporation, functional recovery, and return to preinjury recreational sports activities were observed at 24-month follow-up.

Keywords: Allografts • Cartilage, Articular • Case Reports • Knee Injuries • Osteochondritis Dissecans

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/955010

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Introduction

Osteochondritis dissecans (OCD) of the knee is an acquired disorder of the subchondral bone that can result in secondary disruption of the overlying articular cartilage, leading to pain, mechanical symptoms, and functional limitation. The condition predominantly affects children, adolescents, and young active adults. Although the medial femoral condyle is the most common location, lesions of the lateral femoral condyle are less frequent, accounting for 18.1% of lesions in a large multicenter cohort of 1004 knees with OCD [1]. Patient age, skeletal maturity, lesion stability, and fragment viability are the primary factors guiding treatment selection [2,3].

Stable juvenile lesions may heal with nonoperative treatment; however, unstable lesions or those associated with loose bodies generally require surgical intervention. Internal fixation remains the preferred treatment when the osteochondral fragment is viable, because it preserves native hyaline cartilage and restores joint congruity. Although there are satisfactory reported outcomes, fixation failure can occur because of fragment nonunion, loss of fixation, fragmentation, or progression of subchondral bone necrosis, resulting in persistent pain, recurrent mechanical symptoms, and large osteochondral defects that require salvage procedures [2,3].

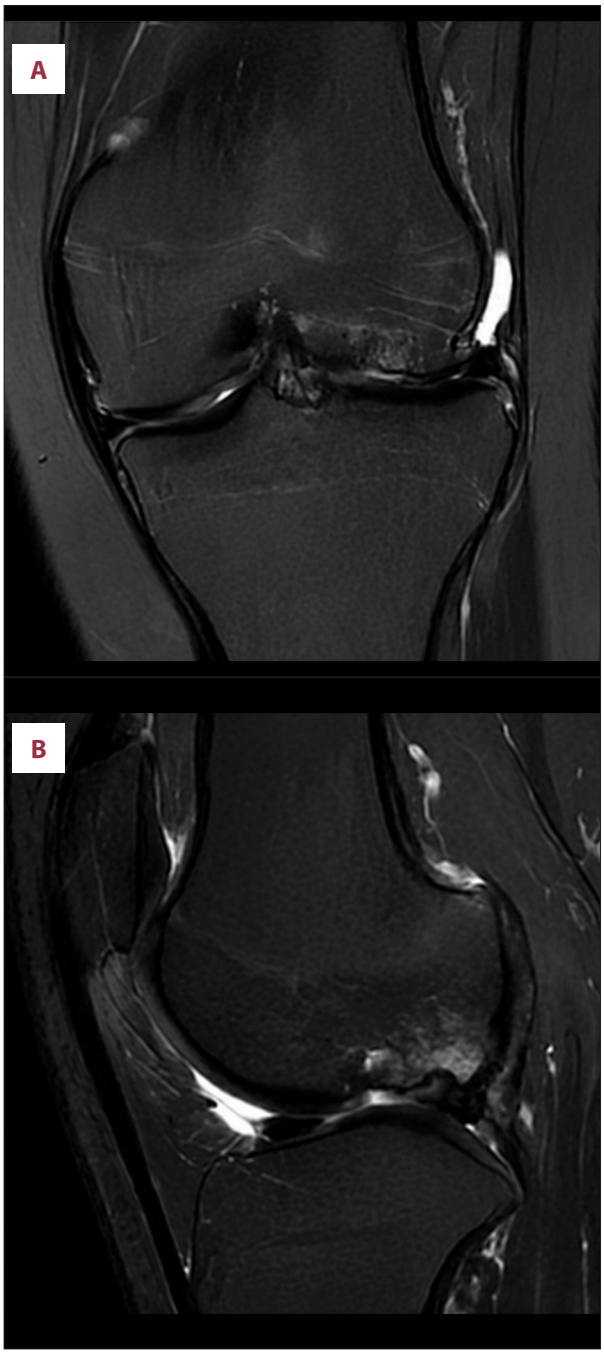
The management of failed OCD fixation remains challenging because treatment must restore both the articular cartilage and the underlying subchondral bone. Fresh osteochondral allograft transplantation (OCA) restores the entire osteochondral unit using mature viable hyaline cartilage and structurally intact subchondral bone, making it particularly suitable for large osteochondral lesions and revision procedures [4-6].

Although fresh OCA has been previously described for the treatment of osteochondral defects, the surgical technique used in this case does not represent a novel OCA procedure. Rather, this report focuses on its use as a salvage strategy after failed internal fixation of an OCD lesion of the lateral femoral condyle, in the setting of retained hardware, recurrent loose bodies, and a large symptomatic osteochondral defect. The case documents the surgical management, graft incorporation, functional recovery, and return to preinjury recreational sports activities at 24-month follow-up.

Case Report

We present the case of a 19-year-old female patient who was first evaluated in our clinic in August 2024. She had a height of 1.70 m, weight of 60 kg, and body mass index of 20.8 kg/m^2. Her medical history was significant for Sinding-Larsen-Johansson syndrome and Osgood-Schlatter disease during childhood and adolescence. She was a competitive recreational athlete participating in high-level sports.

Her symptoms began in 2021 with recurrent episodes of locking and swelling of the left knee. She was initially evaluated by another orthopedic surgeon and received a diagnosis of OCD of the lateral femoral condyle of the left knee. Surgical fixation of the lesion was performed using 2 headless cannulated screws. The patient reported satisfactory postoperative recovery and successful return to high-level sports. However,



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Figure 1. Magnetic resonance imaging of the left knee: (**A**) coronal plane, (**B**) sagittal plane, and (**C**) axial plane, showing signs of osteochondritis dissecans of the lateral femoral condyle.



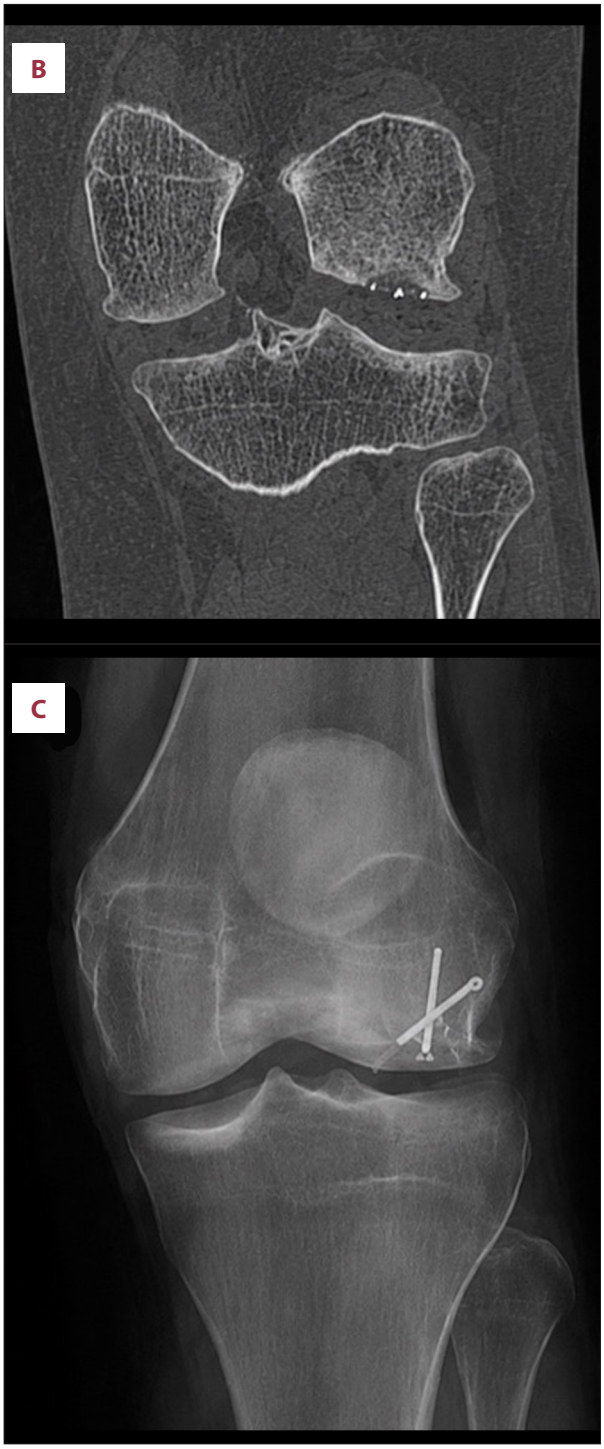


Figure 2. Preoperative computed tomography (CT) and radiographic imaging of the left knee demonstrating 2 retained headless screws from the previous fixation procedure: (**A**) sagittal CT image, (**B**) coronal CT image, and (**C**) anteroposterior radiograph.

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Figure 3. Osteochondral loose body removed during surgery, corresponding to one of the loose bodies identified on preoperative imaging.



Figure 4. Lateral condyle defect in left knee, after being prepared with a 25-mm coring reamer to a depth of 10 mm.

in February 2024, she developed recurrent mechanical locking associated with a loose body that she was able to manually manipulate to unlock the joint.

Physical examination revealed well-healed surgical scars from the previous procedure. The knee demonstrated no erythema, effusion, or visible swelling. Full range of motion was observed, with complete flexion and extension. Mild quadriceps hypotrophy was present. Meniscal and ligamentous examination tests were negative. Lower-limb alignment was clinically and radiographically neutral.

Imaging studies, including anteroposterior and lateral radiographs, computed tomography, and magnetic resonance

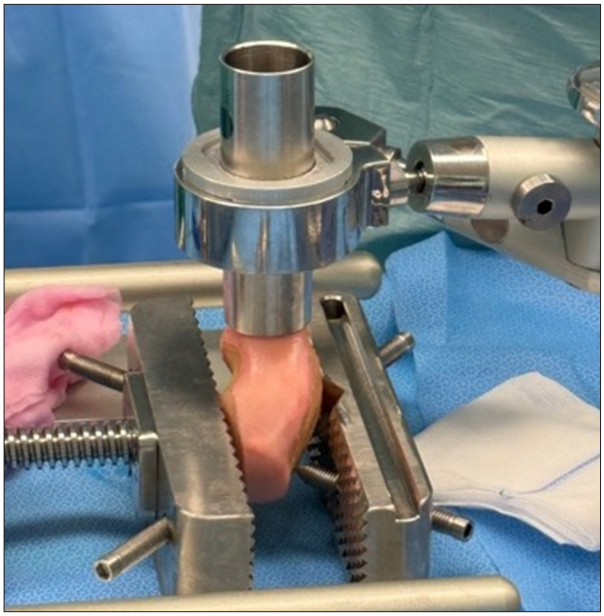


Figure 5. Harvesting of osteochondral allograft from a donor lateral femoral condyle using a 25-mm coring reamer.

imaging, were obtained. These studies confirmed OCD of the lateral femoral condyle of the left knee, with an osteochondral defect measuring 25 × 12 mm located in the posterocentral weight-bearing region. Additionally, 2 osteochondral loose bodies were identified: a 4-mm fragment located in the dependent portion of the lateral recess and an 11-mm fragment within the posteromedial recess (**Figures 1, 2**).

Surgical treatment was indicated, and on August 29, 2024, an open knee surgery was performed. The surgical approach consisted of a 12-cm midline incision and a medial parapatellar arthrotomy. Intraoperative evaluation revealed a 25-mm full-thickness osteochondral defect of the lateral femoral condyle associated with multiple chondral loose bodies and retained headless cannulated screws from the previous fixation, all of which were removed (**Figure 3**). The defect was circumferentially marked and prepared with a 25-mm coring reamer to a depth of 10 mm (**Figure 4**).

A fresh size-matched osteochondral allograft was harvested from the lateral femoral condyle of a cadaveric donor using a 25-mm coring reamer (**Figure 5**). Additional donor-specific characteristics, including donor age, sex, and procurement details, were not available in the clinical record and therefore could not be reliably reported. Graft orientation was marked, and the graft was trimmed according to quadrant-specific depth measurements obtained from the recipient site to ensure an anatomic press-fit (**Figure 6**). After pulse lavage with Microdacyn, the allograft was implanted and gently impacted until flush with the surrounding articular cartilage, restoring a congruent articular surface (**Figure 7**).

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Figure 6. Trimming of the graft according to quadrant-specific depth measurements to ensure an anatomic press-fit.

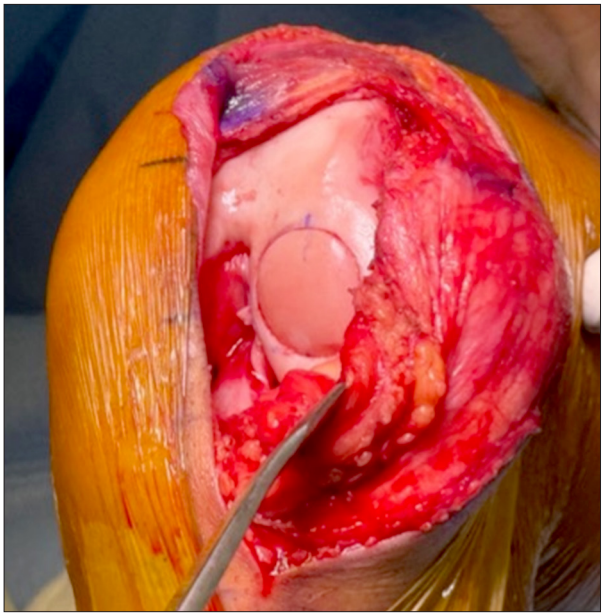


Figure 7. Osteochondral allograft implanted in the lateral femoral condyle in a press-fit manner.

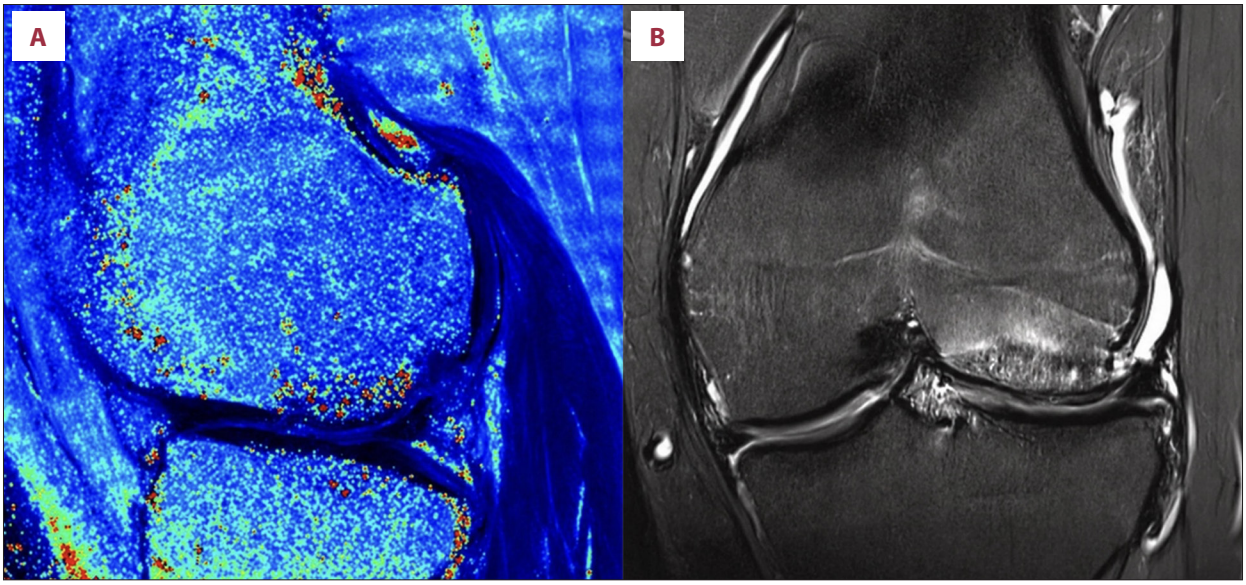


Figure 8. Postoperative magnetic resonance imaging at 24-month follow-up: (**A**) cartilage-sensitive sequences and (**B**) coronal plane.

The postoperative rehabilitation protocol included protected weight-bearing for 4 weeks, with emphasis on achieving full range of motion during the first 2 weeks, followed by progressive strengthening of the quadriceps and gluteal musculature. Unrestricted return to high-level athletic activity was authorized at 9 months postoperatively.

At the 24-month follow-up, the patient had successfully returned to unrestricted participation in her preinjury recreational sports activities, including CrossFit, functional fitness training, and gym-based exercise, at her preinjury level without activity-related symptoms or functional limitations. Clinical examination demonstrated complete recovery of quadriceps strength, restoration of muscle bulk without residual atrophy, and full functional range of motion, with knee flexion of 120° and 5° of physiologic hyperextension, which was symmetrical to the contralateral knee. Meniscal and ligamentous tests remained negative. The patient achieved an International Knee Documentation Committee (IKDC) subjective score of 93/100, and her Tegner Activity Scale score was 7, compared with a preinjury level of 8.

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Postoperative magnetic resonance imaging with cartilage-sensitive sequences demonstrated satisfactory graft incorporation, without evidence of graft subsidence, subchondral cyst formation, recurrent loose bodies, or associated chondral, meniscal, or ligamentous pathology (**Figure 8**). The osteochondral allograft demonstrated complete osseous integration while maintaining a congruent articular surface, without evidence of graft failure.

Discussion

The principal finding of this report is that fresh OCA provided successful restoration of a large symptomatic osteochondral defect of the lateral femoral condyle after failed fixation of OCD, allowing graft incorporation, recovery of knee function, and return to athletic activity. This case illustrates the value of OCA as a joint-preserving procedure capable of restoring both the articular cartilage and subchondral bone in young, active patients for whom primary fixation has failed.

Internal fixation remains the preferred treatment for unstable OCD lesions when the osteochondral fragment is viable because preservation of native hyaline cartilage offers the potential for biological healing. Nevertheless, fixation failure has been reported secondary to nonunion, fragmentation, hardware complications, or progressive subchondral bone insufficiency, resulting in persistent pain and recurrent mechanical symptoms. Once the osteochondral fragment becomes nonviable or a substantial osteochondral defect develops, reconstruction of the entire osteochondral unit becomes necessary rather than isolated cartilage repair [2,3,6].

Fresh OCA has become the preferred reconstructive option for these complex lesions because it restores mature hyaline cartilage together with structurally intact subchondral bone while avoiding donor-site morbidity associated with autologous osteochondral grafting [4-6]. Furthermore, unlike autologous chondrocyte implantation, OCA addresses bone loss and is performed as a single-stage procedure, making it particularly attractive for revision surgery and failed OCD fixation [4,5].

The present case is consistent with the growing body of evidence supporting OCA as a salvage procedure. Gopinatth et al recently demonstrated that OCA following failed cartilage restoration procedures provides satisfactory clinical outcomes despite previous surgical intervention, with graft survivorship comparable to primary transplantation in appropriately selected patients [5]. Similarly, Meeker et al reported no clinically significant differences in patient-reported outcomes or graft survival between revision and primary OCA at midterm follow-up, suggesting that previous cartilage surgery should not be considered a contraindication to allograft transplantation [7].

Long-term durability remains one of the greatest strengths of OCA. Assenmacher et al reported graft survival rates exceeding 80% at 10 years and approximately 75% beyond 15 years, findings that are supported by the long-term series of Raz et al, who demonstrated durable clinical improvement extending beyond 2 decades after transplantation [8,9]. These data support the concept that OCA is not merely a temporizing procedure but rather a reliable joint-preserving strategy capable of delaying or preventing arthroplasty in carefully selected young patients.

Recent literature has also improved our understanding of prognostic factors. Wang et al, in the largest contemporary series, which evaluated 560 knees, identified advanced age, obesity, larger graft size, and certain underlying diagnoses as predictors of failure, whereas OCD was associated with some of the most favorable outcomes after transplantation [10]. Interestingly, Hevesi et al demonstrated that donor-related variables had no clinically meaningful influence on graft survival or functional outcomes, emphasizing that appropriate patient selection and meticulous surgical technique remain more important determinants of success than are donor characteristics [11].

Return to sports represents one of the most relevant outcomes in young athletic patients. In the present case, the patient resumed unrestricted athletic participation after completion of rehabilitation with restoration of quadriceps strength and full functional range of motion. These findings agree with the systematic review by Touhey et al, which reported return-to-sport rates exceeding 70% following OCA, with most athletes returning to their previous level of competition [12]. Comparable results have also been described by Nielsen et al and McCarthy et al, confirming that successful return to recreational and competitive sports is achievable after osteochondral transplantation when rehabilitation is appropriately supervised [13,14]. Although psychological factors such as kinesiophobia may influence postoperative recovery, our patient regained confidence and returned to unrestricted athletic activity without functional limitations [15].

The IKDC Subjective Knee Form is a knee-specific rather than disease-specific instrument and has been validated across a broad range of knee disorders [16]. The Tegner Activity Scale provides a complementary assessment of activity level. Although the patient had a history of Sinding-Larsen-Johansson syndrome and Osgood-Schlatter disease during childhood and adolescence, these conditions were not clinically symptomatic at the time of the current treatment or at final follow-up. Therefore, these historical diagnoses were not considered to preclude interpretation of the IKDC and Tegner scores in the assessment of postoperative knee function and activity level.

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Our case also emphasizes several technical aspects that likely contributed to the favorable outcome. Thorough debridement of the failed fixation construct, complete removal of loose bodies and retained hardware, precise preparation of the recipient socket, and quadrant-specific graft sizing allowed restoration of joint congruity with a stable press-fit construct. Current technical reviews consistently identify accurate graft matching and restoration of the native osteochondral anatomy as fundamental principles for maximizing graft longevity and minimizing contact pressure abnormalities [4,5].

This report has inherent limitations. As a single case, it cannot establish superiority of one treatment over another, and longer clinical follow-up is necessary to determine long-term graft survival. Nevertheless, the favorable clinical and imaging outcomes observed in this patient are consistent with the best available evidence and support the expanding role of OCA in the management of failed OCD fixation.

Overall, this case highlights the role of fresh OCA as a salvage strategy after failed internal fixation of an OCD lesion resulting in a substantial osteochondral defect. Rather than demonstrating a novel surgical technique, the case illustrates the clinical decision-making involved in managing failed fixation and documents the subsequent graft incorporation, functional recovery, and return to athletic activity while preserving the native joint.

Conclusions

Fresh OCA may be considered as a joint-preserving salvage option for carefully selected young patients with large osteochondral defects following failed fixation of OCD. In the present case, satisfactory graft incorporation, functional recovery, and return to preinjury recreational sports activities were observed at 24-month follow-up. Although broader conclusions regarding effectiveness, reliability, long-term durability, or joint preservation cannot be drawn from a single case, this report illustrates the technical feasibility and potential clinical value of fresh OCA in this setting. Further studies with larger cohorts and longer follow-up are warranted to better define its indications and long-term outcomes.

Institution Where Work Was Done

ABC Medical Center, Ortomove, Mexico City, Mexico.

Patient Consent

Written informed consent was obtained from the patient for publication of this case report and the accompanying clinical images and videos.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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