SAS Journal of Surgery
Abbreviated Key Title: SAS J Surg
ISSN 2454-5104
Journal homepage: https://www.saspublishers.com

OPEN ACCESS

Orthopaedics

Fresh Osteochondral Allograft Reconstruction of the Lateral Femoral Condyle after an Open Hoffa Fracture with Bone Loss in a Young Patient: A Case Report

Rui Teixeira Cunha[1]*, João Jesus Silva[1,2], Filipe Machado[1], Tomás Nunes[1], Mafalda Batista[1], Pedro Pessoa[1], Carlos Ribeiro[1]

[1]Department of Orthopaedics, Hospital Ortopédico Sant'Iago do Outão, Unidade Local de Saúde da Arrábida, Setúbal, Portugal
[2]Department of Orthopaedics, Hospital de São Francisco Xavier, Unidade Local de Saúde de Lisboa Ocidental, Lisbon, Portugal

DOI: https://doi.org/10.36347/sasjs.2026.v12i11.009 | **Received:** 25.09.2026 | **Accepted:** 13.11.2026 | **Published:** 16.11.2026

***Corresponding author:** Rui Teixeira Cunha
Department of Orthopaedics, Hospital Ortopédico Sant'Iago do Outão, Unidade Local de Saúde da Arrábida, Setúbal, Portugal

Abstract **Case Report**

Large traumatic defects of the weight-bearing femoral condyle are difficult to reconstruct in young patients, in whom arthroplasty should be avoided. We report a healthy 17-year-old boy with a Gustilo-Anderson type IIIA open injury of the right knee after a motorcycle collision, comprising a Hoffa fracture of the lateral femoral condyle (Letenneur type III) with significant bone loss, an avulsion of the lateral epicondyle and a vertical fracture of the lateral patellar facet. Emergency treatment consisted of lavage, debridement, screw fixation of the epicondylar avulsion and cerclage of the patella, followed by a 14-day hospital stay for antibiotic therapy. At five months the wound had healed, but the bone defect in the weight-bearing zone caused valgus instability between 0° and 45° of flexion. The defect was reconstructed with a fresh cadaveric osteochondral allograft. The recipient bed was prepared as a rectangular block, the graft was shaped on a separate workstation to match it, stability and motion were tested with provisional fixation, and the graft was fixed with two headless compression screws. There were no postoperative complications. Weight-bearing was protected for six weeks. At eight months the range of motion was almost symmetrical to the contralateral knee (5° of hyperextension to 140° of flexion), daily activities were unrestricted and the patient tolerated short-distance running; the International Knee Documentation Committee (IKDC) score was 52% and the Tegner-Lysholm score 79/100. At one year he could squat and jog unaided. Fresh osteochondral allograft reconstruction may be a feasible option for traumatic hemicondylar bone loss in young patients and defers arthroplasty, although long-term graft survival remains uncertain.

Keywords: Hoffa fracture, open fracture, femoral condyle, bone loss, osteochondral allograft, knee reconstruction, young patient.

Copyright © 2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC 4.0)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

INTRODUCTION

Hoffa fractures are coronal-plane fractures of the femoral condyle. They account for about 0.65% of femoral fractures, usually follow high-energy trauma and involve the lateral condyle in 78% to 85% of cases [1]. Anatomical reduction and rigid internal fixation are preferred [2], but long-term results are often unsatisfactory, with frequent osteoarthritis [3]. When an open injury also removes part of the weight-bearing condyle, fixation of the fragments is no longer possible and the joint must be reconstructed. In a young patient, the aim is to avoid arthroplasty.

Fresh osteochondral allografts replace bone and viable hyaline cartilage in a single stage and have shown durable survivorship in posttraumatic defects of the femoral condyle [4–6]. Their use for traumatic hemicondylar bone loss has been described mainly in isolated case reports [7–9]. We report a 17-year-old patient with an open Hoffa fracture and loss of the lateral femoral condyle who was reconstructed with a fresh osteochondral allograft.

CASE REPORT

Presentation and emergency treatment

A healthy 17-year-old boy was brought by the emergency medical services after a high-energy motorcycle collision with another vehicle. He was wearing a helmet, had no loss of consciousness and a Glasgow Coma Scale score of 15. Computed tomography (CT) of the head, cervical spine and chest showed no other significant injuries. The right knee had

a 20-cm incised-contused wound over the anterolateral aspect with intra-articular exposure. The extensor mechanism was intact and there was no neurovascular deficit. Radiographs showed an avulsion of the lateral epicondyle and a vertical fracture of the lateral patellar facet. The injury was classified as a Gustilo-Anderson type IIIA open fracture [10] with a Hoffa fracture of the lateral femoral condyle (Letenneur type III [11]) and significant bone loss (Figure 1). Cefazolin and gentamicin were given and the knee was irrigated with 4 L of saline in the resuscitation room.



Figure 1: Anteroposterior (A) and lateral (B) radiographs of the right knee at presentation, showing the lateral femoral condyle fracture with bone loss and the lateral epicondylar avulsion

The patient underwent surgical lavage and debridement, osteosynthesis of the lateral epicondylar avulsion with a 4.0-mm cannulated screw and washer, and cerclage of the patellar fracture with a high-strength multifilament suture, followed by closure in layers. Follow-up imaging showed the bone defect of the lateral femoral condyle (Figure 2). He remained in hospital for 14 days for antibiotic therapy. At discharge the wound was dry and inflammatory markers were decreasing. He was discharged with a hinged brace locked at 30° and walked with two crutches without loading the limb.

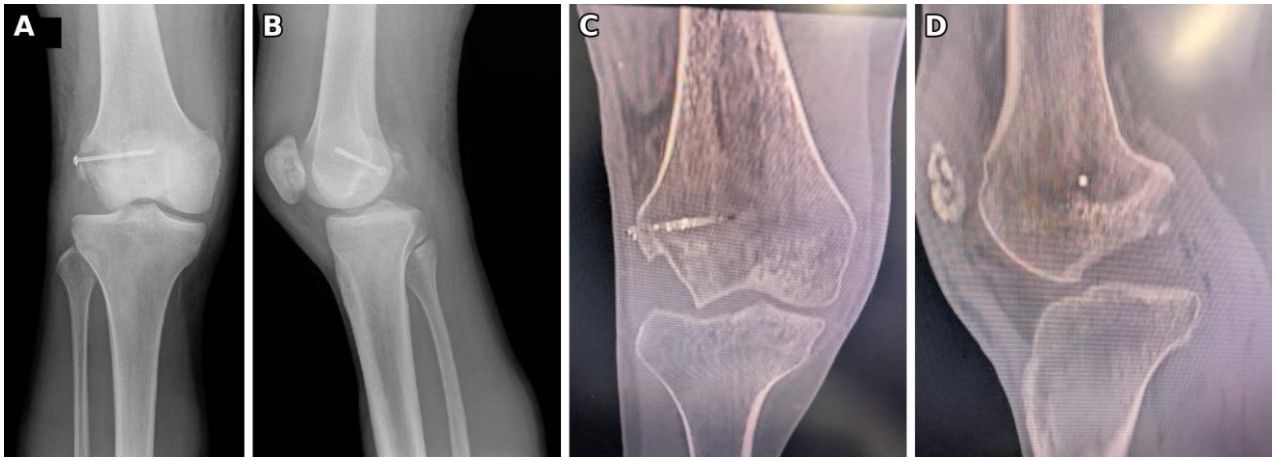


Figure 2: Anteroposterior (A) and lateral (B) radiographs three weeks after emergency fixation. Coronal (C) and sagittal (D) CT reconstructions showing the bone defect of the lateral femoral condyle and the screw in place

Interval and definitive reconstruction

Five months after the injury the wound had healed completely, without inflammatory signs (Figure 3). The knee had valgus instability from 0° to 45° of flexion, attributed to the bone defect in the weight-bearing zone, and he used a hinged brace. The collateral ligaments were considered intact.



Figure 3: Right knee five months after the injury, before reconstruction, with healed lateral wounds

Reconstruction was performed with a fresh cadaveric osteochondral allograft. The previous hardware was removed and the recipient bed was regularised into a rectangular block of bone. The allograft was shaped on a separate workstation to fit this bed (Figure 4A, B). With the graft in the defect (Figure 4C), varus-valgus stability and range of motion were tested after provisional fixation with K-wires, and fluoroscopy confirmed its position (Figure 4D). The graft was then fixed with two headless cannulated compression screws (Arthrex®, Naples, FL, USA) inserted from lateral to medial. There were no intraoperative or postoperative complications, and he was discharged on the third postoperative day with a hinged brace, two crutches and prophylactic enoxaparin for 15 days.

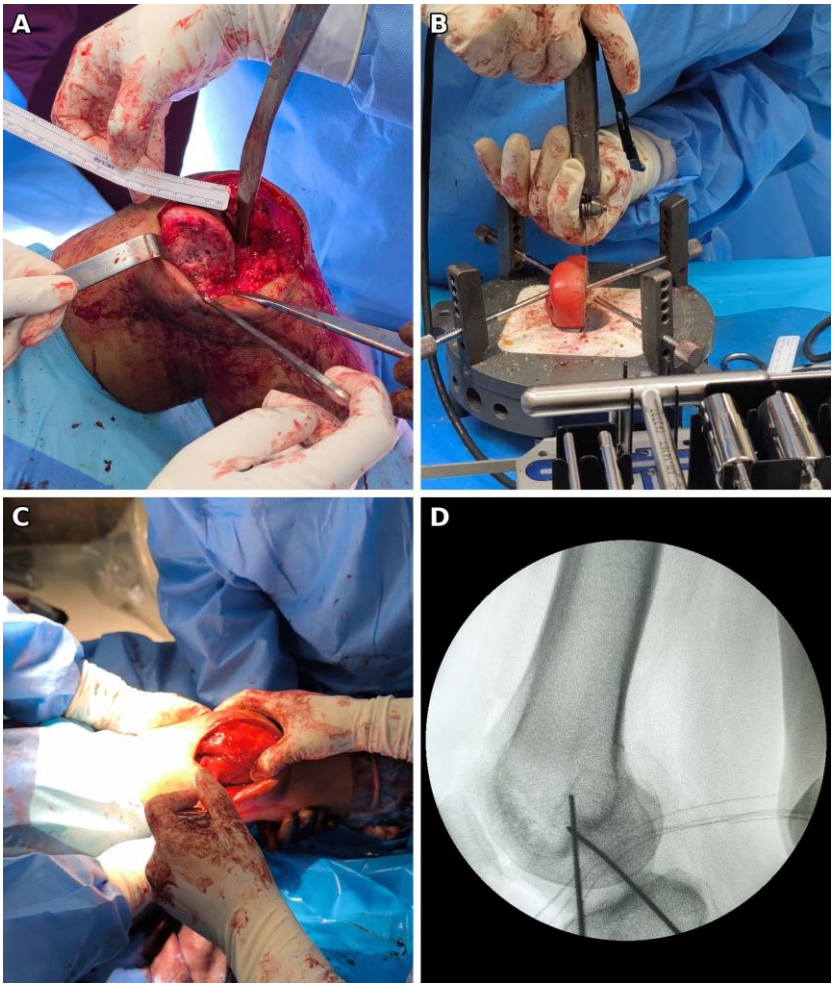


Figure 4: Intraoperative images. (A) Recipient site prepared and measured. (B) Allograft shaped on a separate workstation. (C) Allograft positioned in the defect. (D) Fluoroscopic image with provisional K-wire fixation

Rehabilitation and outcome

Passive and active mobilisation of the knee was allowed as tolerated, with partial weight-bearing on two crutches for six weeks. After radiographic control he progressed to full weight-bearing and discontinued the crutches. Radiographs at three weeks and three months showed the graft in position with unchanged fixation (Figure 5).

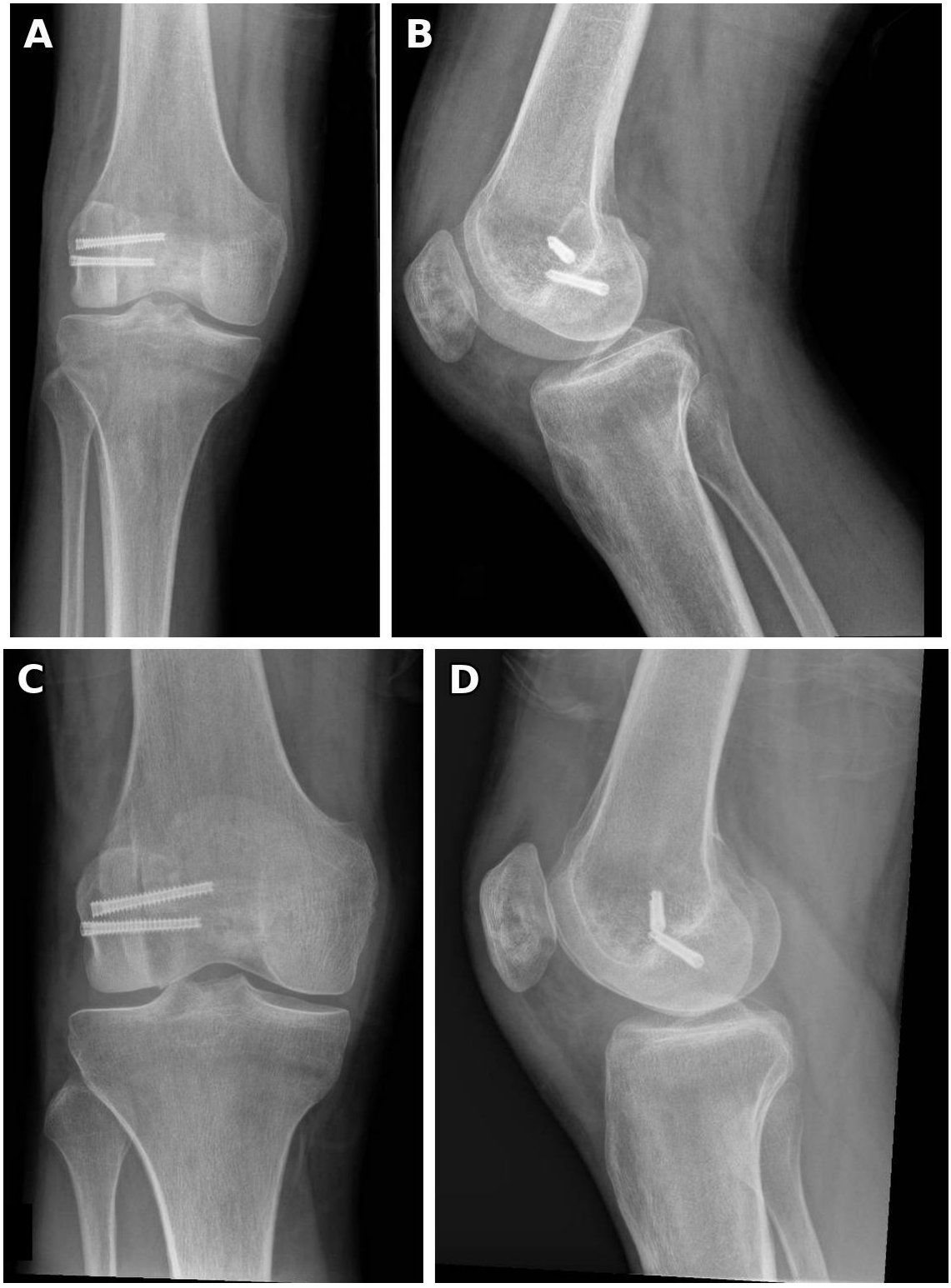


Figure 5: Anteroposterior and lateral radiographs three weeks (A, B) and three months (C, D) after reconstruction, showing the allograft fixed with two headless compression screws

At eight months the range of motion was almost symmetrical to the contralateral knee (5° of hyperextension to 140° of flexion). He had no limitation in daily activities and tolerated short-distance running.

The IKDC score was 52% and the Tegner-Lysholm score 79/100. At one year he could squat and jog unaided (Figure 6).



Figure 6: Squat (A) and jogging (B) one year after reconstruction

DISCUSSION

This patient combined an open Hoffa fracture with loss of the weight-bearing lateral condyle at the age of 17. Fixation of the fragments was not feasible, which left arthroplasty or biological reconstruction. We chose a fresh osteochondral allograft because the defect involved a single condyle, the collateral ligaments were intact and the patient was young; arthroplasty was thus deferred and remains available if the graft fails. Fresh allografts are rarely the first option for structural bone loss, because graft availability and size matching, graft viability and technical demands limit their use, and the evidence is scarce.

Published results with allografts for posttraumatic femoral condyle defects support this choice. In a prospective series of 60 femoral condyle grafts followed for a mean of 10 years, survivorship was 95% at 5 years and 85% at 10 years [4]. In 122 patients (129 knees), survivorship was 82% at 10 years, and age over 30 years and two or more previous operations were associated with failure [5]. Our patient was 18 years old at transplantation. Survivorship was lower in a series of 244 bulk grafts for very large uncontained defects, as in our patient: 86.6% at 5 years, 73.3% at 10 years and 58.1% at 15 years [6]. Conversion to arthroplasty must therefore be anticipated in the long term. A systematic review reported significant improvement in clinical scores and success in 75% of patients at 12.3 years [12], and experience in patients younger than 18 years is limited [13].

Case reports describe similar reconstructions. Hornstein *et al.* used a massive osteoarticular allograft of the lateral femoral condyle in a 15-year-old with an open grade III condylar fracture and reported full extension and 90° of flexion at 10 years [8]. Nizegorodcew *et al.* reconstructed massive lateral condyle bone loss after a motorcycle accident with a large allograft in a 37-year-old man, who needed two arthroscopic arthrolyses; MRI showed favourable integration [7]. Yates *et al.* reported a bulk fresh osteochondral allograft for open knee trauma with 20 years of follow-up [9].

Three technical points may have contributed. First, treatment was staged: urgent debridement and stabilisation, followed by reconstruction once the wound had healed without inflammatory signs. Second, the recipient bed was regularised into a rectangular block, so that the graft could be shaped on a separate workstation to match it. Third, the graft was fixed rigidly with headless compression screws, because long-term allograft survival depends on stable fixation of graft bone to host bone [14]. Stability and motion were tested with provisional fixation before the final screws.

Range of motion and daily function were near normal at eight months, but an IKDC score of 52% and a Tegner-Lysholm score of 79/100 indicate residual symptoms. This report has limitations: it describes a single patient, follow-up is about one year after reconstruction, graft incorporation was assessed on plain radiographs only, preoperative scores are not available, and the risks of graft collapse, degenerative change and conversion to arthroplasty remain to be defined.

CONCLUSION

In a young patient with an open Hoffa fracture and loss of the weight-bearing lateral condyle, staged reconstruction with a fresh osteochondral allograft fixed with headless compression screws gave near-normal range of motion and unrestricted daily activity at one year. It may be a feasible option to defer arthroplasty, but longer follow-up is needed.

DECLARATIONS

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

Conflicts of interest: The authors declare no conflicts of interest.

Funding: This work received no specific funding.

REFERENCES

1. Patel, P. B., & Tejwani, N. C. (2018). The Hoffa fracture: Coronal fracture of the femoral condyle, a review of literature. *Journal of Orthopaedics, 15*(2), 726–731. https://doi.org/10.1016/j.jor.2018.05.027
2. Zhou, Y., Pan, Y., Wang, Q., Hou, Z., & Chen, W. (2019). Hoffa fracture of the femoral condyle: Injury mechanism, classification, diagnosis, and treatment. *Medicine, 98*(8), e14633. https://doi.org/10.1097/MD.0000000000014633
3. Onay, T., Gulabi, D., Colak, I., Bulut, G., Gumustas, S. A., & Cecen, G. S. (2018). Surgically treated Hoffa fractures with poor long-term functional results. *Injury, 49*(2), 398–403. https://doi.org/10.1016/j.injury.2017.11.026
4. Gross, A. E., Shasha, N., & Aubin, P. (2005). Long-term followup of the use of fresh osteochondral allografts for posttraumatic knee defects. *Clinical Orthopaedics and Related Research, 435*, 79–87. https://doi.org/10.1097/01.blo.0000165845.21735.05
5. Levy, Y. D., Görtz, S., Pulido, P. A., McCauley, J. C., & Bugbee, W. D. (2013). Do fresh osteochondral allografts successfully treat femoral condyle lesions? *Clinical Orthopaedics and Related Research, 471*(1), 231–237. https://doi.org/10.1007/s11999-012-2556-4
6. Daud, A., Safir, O. A., Gross, A. E., & Kuzyk, P. R. T. (2021). Outcomes of bulk fresh osteochondral allografts for cartilage restoration in the knee. *The Journal of Bone and Joint Surgery. American Volume, 103*(22), 2115–2125. https://doi.org/10.2106/JBJS.20.00350
7. Nizegorodcew, T., Palmieri, G., Peruzzi, M., & Galli, M. (2018). Allograft for the treatment of traumatic severe bone loss in the lateral femoral condyle: A case report. *Injury, 49*(Suppl. 4), S16–S20.
8. Hornstein, S., Moukoko, D., Deroussen, F., Plancq, M. C., Collet, L. M., & Gouron, R. (2015). Successful hemicondylar femoral allograft for traumatic bone loss: A paediatric case study with ten years of follow-up. *The Knee, 22*(1), 63–66. https://doi.org/10.1016/j.knee.2014.10.008
9. Yates, E. W., Boden, R. A., Suvarna, K., & Stockley, I. (2016). Fresh osteochondral allograft with soft tissue reconstruction for open knee trauma: A 20-year follow-up. *Annals of the Royal College of Surgeons of England, 98*(2), e34–e36. https://doi.org/10.1308/rcsann.2016.0059
10. Gustilo, R. B., & Anderson, J. T. (1976). Prevention of infection in the treatment of one thousand and twenty-five open fractures of long bones: Retrospective and prospective analyses. *The Journal of Bone and Joint Surgery. American Volume, 58*(4), 453–458.
11. Letenneur, J., Labour, P. E., Rogez, J. M., Lignon, J., & Bainvel, J. V. (1978). Fractures de Hoffa: À propos de 20 observations. *Annales de Chirurgie, 32*(3–4), 213–219.
12. Assenmacher, A. T., Pareek, A., Reardon, P. J., Macalena, J. A., Stuart, M. J., & Krych, A. J. (2016). Long-term outcomes after osteochondral allograft: A systematic review at long-term follow-up of 12.3 years. *Arthroscopy, 32*(10), 2160–2168. https://doi.org/10.1016/j.arthro.2016.04.020
13. Murphy, R. T., Pennock, A. T., & Bugbee, W. D. (2014). Osteochondral allograft transplantation of the knee in the pediatric and adolescent population. *The American Journal of Sports Medicine, 42*(3), 635–640. https://doi.org/10.1177/0363546513516747
14. Gross, A. E., Kim, W., Las Heras, F., Backstein, D., Safir, O., & Pritzker, K. P. H. (2008). Fresh osteochondral allografts for posttraumatic knee defects: Long-term followup. *Clinical Orthopaedics and Related Research, 466*(8), 1863–1870. https://doi.org/10.1007/s11999-008-0282-8