

Rowan University

Rowan Digital Works

Stratford Campus Research Day

26th Annual Research Day

May 5th, 12:00 AM

The Utilization of Osteoarticular Transfer System in the Treatment of Distal Femur Osteoid Osteoma: A Case Report

Nikki A. Doerr
Rowan University


Efstratios A. Papadelis
Philadelphia College of Osteopathic Medicine

Alec S. Kellish
Rowan University

Matthew T. Kleiner
Cooper University Hospital

Christina Gutowski
Cooper University Hospital

Follow this and additional works at: https://rdw.rowan.edu/stratford_research_day

 Part of the [Musculoskeletal Diseases Commons](#), [Neoplasms Commons](#), [Oncology Commons](#), [Orthopedics Commons](#), [Surgery Commons](#), and the [Surgical Procedures, Operative Commons](#)
Let us know how access to this document benefits you - share your thoughts on our [feedback form](#).

Doerr, Nikki A.; Papadelis, Efstratios A.; Kellish, Alec S.; Kleiner, Matthew T.; and Gutowski, Christina, "The Utilization of Osteoarticular Transfer System in the Treatment of Distal Femur Osteoid Osteoma: A Case Report" (2022). *Stratford Campus Research Day*. 110.
https://rdw.rowan.edu/stratford_research_day/2022/May5/110

This Poster is brought to you for free and open access by the Conferences, Events, and Symposia at Rowan Digital Works. It has been accepted for inclusion in Stratford Campus Research Day by an authorized administrator of Rowan Digital Works.

The Utilization of Osteoarticular Transfer System in the Treatment of Distal Femur Osteoid Osteoma: A Case Report

Nikki A. Doerr MSBS¹, Efstratios A. Papadelis DO², Alec S. Kellish, MD³, Matthew T. Kleiner MD⁴, Christina J. Gutowski MD MPH⁴

¹Rowan University School of Osteopathic Medicine, Stratford New Jersey, ²Philadelphia College of Osteopathic Medicine, Department of Orthopaedic Surgery, ³Thomas Jefferson University, Department of Orthopaedic Surgery, ⁴Department of Orthopaedic Surgery, Cooper University Hospital

Abstract

Introduction

Tumor excision of the subchondral bone of the distal femur epiphysis is technically challenging particularly in skeletally-immature patients due to the open physis above and articular surface below. Preservation of the physis, maintenance of structural support to, and integrity of, the cartilage, and conservation of joint kinematics must all be considered and are often threatened by current percutaneous or open surgical treatment options.

Materials and Methods

We present a case of a 16-year-old male athlete with a distal femur epiphyseal bone lesion. He underwent transarticular en bloc excision and autograft reconstruction using Osteoarticular Transfer System (OATS) technique.

Results

Final pathology revealed complete excision of an osteoid osteoma. The patient had regained full strength and range of motion at 3 months postoperatively, and at 21 months postoperatively was free of disease and back to full level of athletic participation.

Conclusions

We describe a technique for excision of subchondral epiphyseal bone lesions in the distal femur in skeletally immature patients that mitigates risk of complications associated with physeal injury, incomplete tumor resection, and iatrogenic injury to the overlying cartilage.

Background

- Osteoid osteomas are painful, benign, osteoblastic tumors representing about 15% of benign and 3% of all primary bone tumors.^{1, 2}
- While rare, these tumors can arise within the epiphysis where they can be difficult to excise due to the risk of articular cartilage damage and physeal disruption in skeletally immature patients.^{4, 5}
- Initial management is conservative with nonsteroidal anti-inflammatory which control symptoms and can hasten spontaneous regression.⁶
- If medical management fails or is unsatisfactory, most osteoid osteomas are treated with minimally invasive techniques such as CT-guided percutaneous radiofrequency ablation, MR-guided high-intensity focused ultrasound or surgical resection with curettage.^{7, 8, 9}
- Challenges arise when these lesions develop in subchondral, subcutaneous, or perineural locations, where percutaneous treatment modalities may cause injury to cartilage, skin, or nerve tissue in close proximity to the bone lesion.
- Very few cases of an osteoid osteoma in the distal femoral epiphysis have been described in literature.^{9, 10, 11, 12, 13}
- This anatomic location is particularly tenuous in a skeletally immature patient, due to proximity of the physis above and cartilage below, and the importance of maintaining subchondral bone integrity to preserve physiologic joint kinematics.^{9, 10, 11, 12, 13}
- The OATS procedure, first described in 1991, demonstrates improved clinical outcomes as a cartilage resurfacing technique.
- Its use is thoroughly described in the orthopaedic sports medicine literature, but its utility as a reconstructive technique after distal femur tumor resection has not been reported.

Case Summary

We present a case of a 16-year-old male athlete with a distal femur epiphyseal bone lesion. Given the failure of nonoperative management as well as the surgical constraints of this epiphyseal location, the surgeon recommended trans-articular en bloc excision of the tumor and autograft reconstruction utilizing Osteoarticular Transfer System (OATS) technique. Final pathology revealed complete excision of an osteoid osteoma. The patient had regained full strength and range of motion at 3 months postoperatively, and at 21 months postoperatively was free of disease and back to full level of athletic participation.

Figures

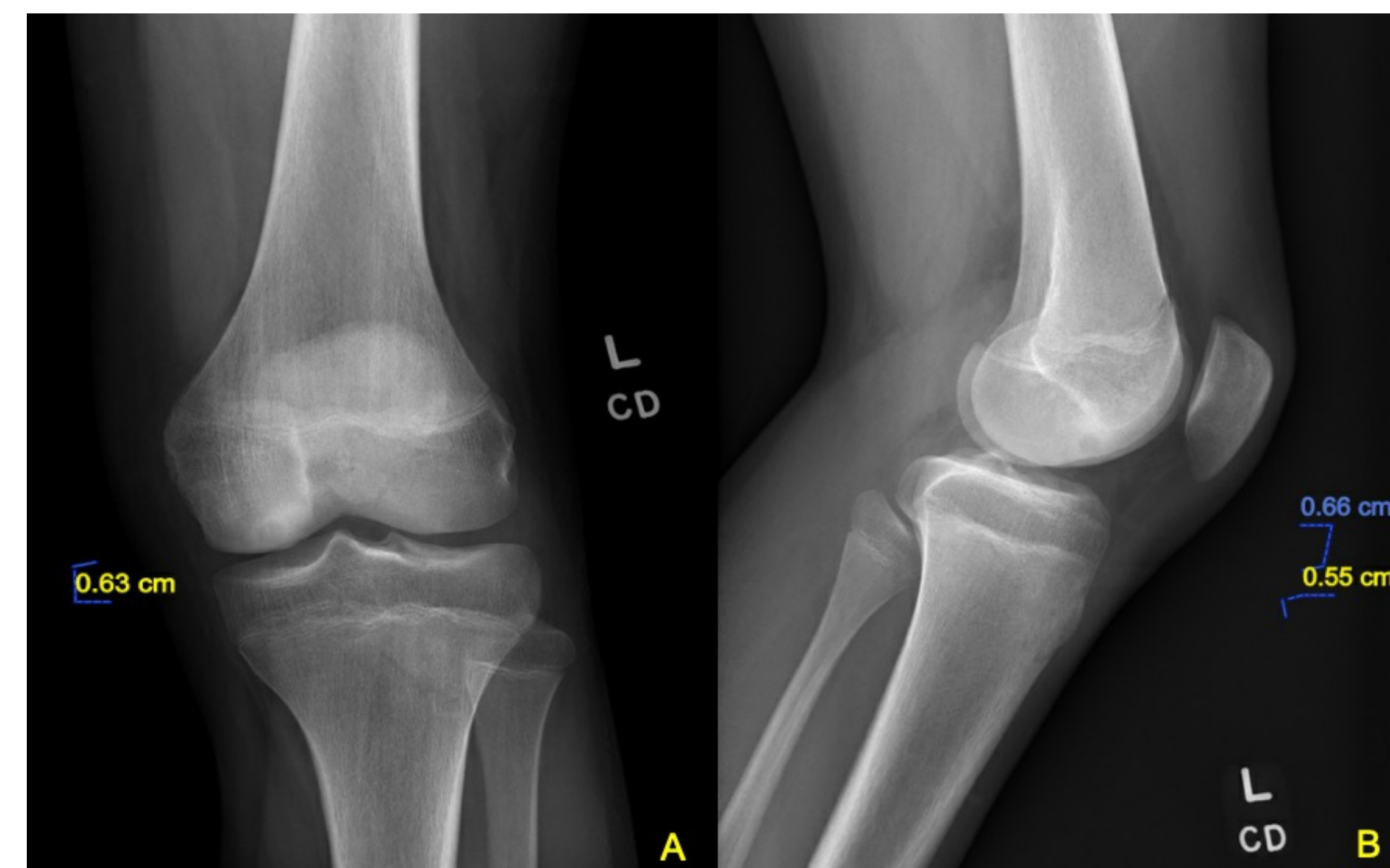


Figure 1A and 1B – Anteroposterior (Fig. 1A) and lateral (Fig. 1B) radiographs of left knee, demonstrating a subchondral round lucent lesion with sclerotic rim in lateral aspect of the medial femoral condyle.

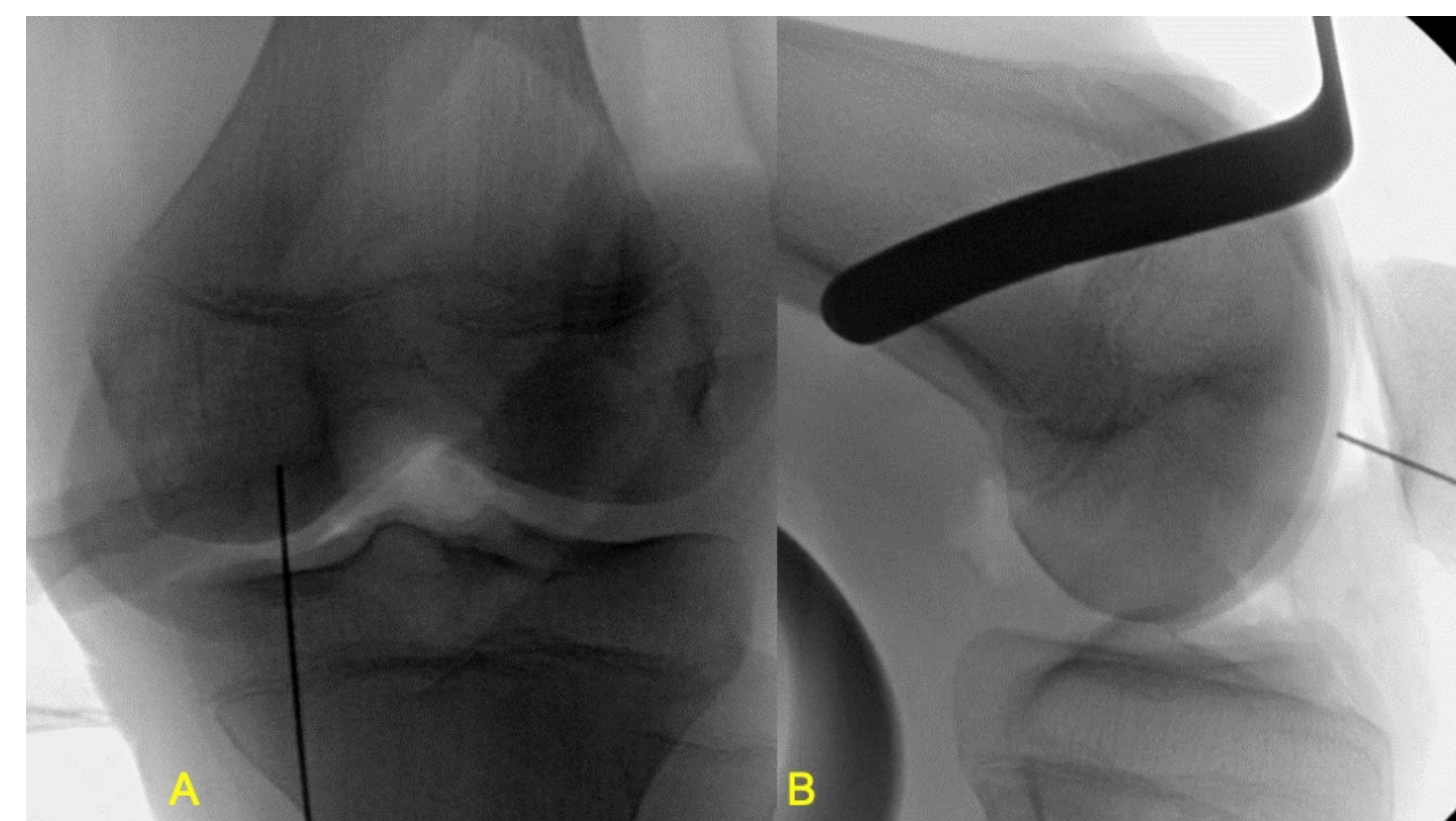


Figure 2A and 2B – Intraoperative fluoroscopy demonstrating round sclerotic-rimmed bone lesion in the medial femoral condyle (Fig. 2A) anteroposterior view and (Fig. 2B) lateral view.



Figure 3A and 3B – Plug of medial femoral condyle, completely containing tumor with negative margins.



Figure 4 – Intraoperative photograph of distal femur after OATS transfer.

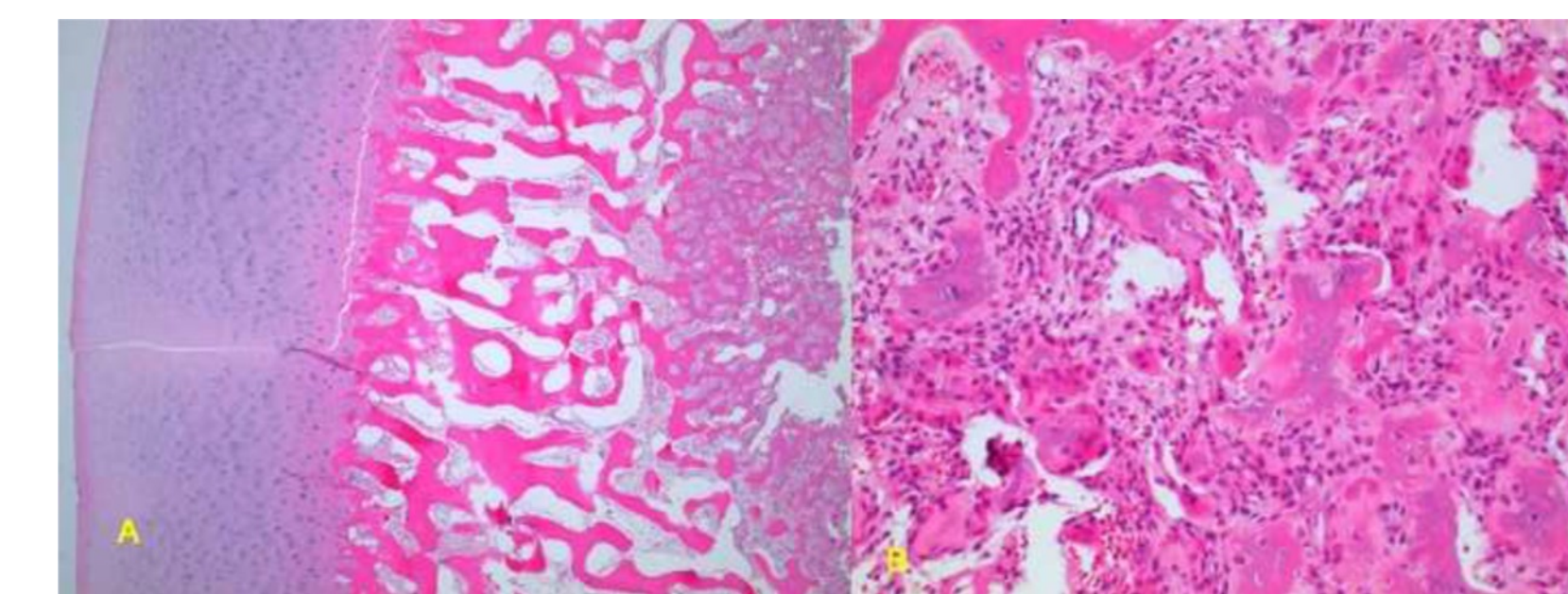


Figure 5A and 5B – Histopathologic examination of resection specimen. Low power (Fig 5A) 2.5x H&E stain demonstrates the transition from overlying distal femoral articular cartilage (left side of slide) to the underlying neoplasm (right side of slide.) High power (Fig 5B) 20x H&E stain demonstrates the center of the nidus, composed of woven bone rimmed by osteoblasts and a few osteoclasts, with rich vasculature.



Figure 6A-6C – Anteroposterior (Fig 6A), lateral (Fig 6B), and oblique (Fig 6C) radiographs illustrating the healed OATS reconstruction, 21 months postoperatively.

Discussion

- The primary aim of surgical oncology is local tumor control with adequate resection.¹⁵
- Failed medical management of a diaphyseal osteoid osteoma is typically treated with minimally invasive techniques, while no consensus exists for an epiphyseal osteoid osteoma.^{7, 8, 9}
- These lesions give rise to surgical constraints in skeletally immature patients due to the proximity of the physis above and cartilage below, complicating both excision and reconstructive options.⁵
- The OATS technique with autograft has been well described in orthopaedic sports medicine literature for its utility in small cartilaginous defects in the knee, such as osteochondritis dissecans, as well as focal cartilage damage involving the hip, ankle, shoulder, and elbow.¹⁷
- Transarticular en bloc excision with autograft reconstruction utilizing OATS technique for an epiphyseal osteoid osteoma offers high healing potential with minimal donor-site morbidity and a superior method of cartilage resurfacing.^{20, 21, 22}
- It also allows for excellent access to the lesion enabling precise and thorough excision while minimizing risk of physis disturbance in skeletally immature patients, decreasing risk of limb length inequality and malalignment.⁹

Conclusion

- Our study offers 21 months of follow-up of a pediatric patient who underwent transarticular en bloc excision with OATS reconstruction for complete tumor excision and maintenance of the biomechanical properties of original hyaline cartilage while mitigating physeal injury.
- This technique should be considered as an excellent treatment option for epiphyseal bone lesions in skeletally immature patients.

References

- Hürun, Mutlu, et al. "Atypical Location of an Osteoid Osteoma with Atypical Anterior Knee Pain." *International Journal of Surgery Case Reports*, vol. 5, no. 11, 2014, pp. 873-76. DOI.org (Crossref), <https://doi.org/10.1016/j.ijscr.2014.10.015>.
- Ghanem, Ismat. "The Management of Osteoid Osteoma: Updates and Controversies." *Current Opinion in Pediatrics*, vol. 18, no. 1, Feb. 2006, pp. 36-41. DOI.org (Crossref), <https://doi.org/10.1097/01.mop.0000193277.47113.15>.
- Tepelenis, Kostas, et al. "Osteoid Osteoma: An Updated Review of Epidemiology, Pathogenesis, Clinical Presentation, Radiological Features, and Treatment Option." *In Vivo*, vol. 35, no. 4, 2021, pp. 1929-38. DOI.org (Crossref), <https://doi.org/10.21873/invivo.12459>.
- Francisco, Francisco, et al. "Intra- and Juxta-Articular Osteoid Osteoma: A Diagnostic Challenge: Misdiagnosis and Successful Treatment: A Report of Four Cases." *Archives of Orthopaedic and Trauma Surgery*, vol. 126, no. 10, Oct. 2006, pp. 660-67. DOI.org (Crossref), <https://doi.org/10.1007/s00402-006-0203-9>.
- Osaka, T., et al. "Intra-articular Epiphyseal Osteoid Osteoma of the Distal Femur." *Journal of Pediatric Orthopaedics*, vol. 7, no. 3, May 1987, pp. 259-333. DOI.org (Crossref), <https://doi.org/10.1097/01214398-198705000-00017>.
- Atesok, Kıvıncı, et al. "Osteoid Osteoma and Osteoblastoma." *American Academy of Orthopaedic Surgeons*, vol. 19, no. 11, Nov. 2011, pp. 618-69. DOI.org (Crossref), <https://doi.org/10.5435/00124333-201111000-00004>.
- Iyer, Ramesh S., et al. "Pediatric Bone Imaging: Diagnostic Imaging of Osteoid Osteoma." *American Journal of Roentgenology*, vol. 198, no. 5, May 2012, pp. 1039-52. DOI.org (Crossref), <https://doi.org/10.2214/AJR.10.7313>.
- Allen, S. D., and A. Sahadddin. "Imaging of Intra-Articular Osteoid Osteoma." *Clinical Radiology*, vol. 58, no. 11, Nov. 2003, pp. 845-52. DOI.org (Crossref), <https://doi.org/10.1054/cr.2003.92600>.
- Monroe, Emily J., et al. "Intra-Articular Osteoid Osteoma of the Distal Femur Treated with Osteochondral Grafting: A Report of 2 Cases." *JBS Case Connector*, vol. 9, no. 2, Apr. 2019, pp. e0211-e0211. DOI.org (Crossref), <https://doi.org/10.2106/JBS.CC.18.00211>.
- Bavaneh, Motasim K., et al. "A Review of Literature: Mosaicplasty as an Alternative Treatment for Resection of Patellar Osteoid Osteoma and Cartilage Reconstruction." *Journal of Orthopaedics*, vol. 15, no. 3, Sept. 2018, pp. 768-71. DOI.org (Crossref), <https://doi.org/10.1016/j.jor.2018.05.006>.
- Abnous, Freddy, et al. "Arthroscopic Visualization and Assisted Excision of Osteoid Osteoma at the Knee: A Case Report and Review." *The American Journal of Sports Medicine*, vol. 36, no. 2, Feb. 2008, pp. 375-78. DOI.org (Crossref), <https://doi.org/10.1177/0363546507307865>.
- Gunes, Tamer, et al. "Arthroscopic Excision of the Osteoid Osteoma at the Distal Femur." *Knee Surgery, Sports Traumatology, Arthroscopy*, vol. 16, no. 1, Jan. 2008, pp. 90-93. DOI.org (Crossref), <https://doi.org/10.1007/s00167-007-0380-2>.
- Kang, Suk, et al. "Arthroscopic Excision of an Intra-articular Osteoid Osteoma in the Distal Femur." *Clinics in Orthopaedic Surgery*, vol. 8, no. 4, 2016, p. 475. DOI.org (Crossref), <https://doi.org/10.4055/cios.2016.8.4.475>.
- Hangody, László, and Péter Fülöp. "AUTOLOGOUS OSTEOCHONDRAL MOSAICPLASTY FOR THE TREATMENT OF FULL-THICKNESS DEFECTS OF WEIGHT-BEARING JOINTS: TEN YEARS OF EXPERIMENTAL AND CLINICAL EXPERIENCE." *The Journal of Bone and Joint Surgery-American Volume*, vol. 85, 2003, pp. 15-22. DOI.org (Crossref), <https://doi.org/10.2106/00004623-200300002-00004>.
- Muscolo, D. Luis, et al. "Uniclyon® Osteoarticular Allografts of the Knee." *The Journal of Bone and Joint Surgery-American Volume*, vol. 90, Oct. 2008, pp. 206-17. DOI.org (Crossref), <https://doi.org/10.2106/JBS.H.00315>.
- Hayashi, Kazuhiko, et al. "Clinical Course of Grafted Cartilage in Osteoarticular Freeze Autografts for Reconstruction after Resection of Malignant Bone and Soft-Tissue Tumor Involving an Epiphysis." *Journal of Bone Oncology*, vol. 24, Oct. 2020, p. 100310. DOI.org (Crossref), <https://doi.org/10.1016/j.jbo.2020.100310>.
- Leeman, Joshua J., et al. "Intra-Articular Osteoid Osteoma at the Femoral Trochlea Treated with Osteochondral Autograft Transplantation." *Journal of Radiology Case Reports*, vol. 12, no. 6, June 2018, pp. 24-29. DOI.org (Crossref), <https://doi.org/10.3945/jrcr.v12i06.2817>.
- Camp, Christopher L., et al. "Current Concepts of Articular Cartilage Restoration Techniques in the Knee." *Sports Health: A Multidisciplinary Approach*, vol. 6, no. 3, May 2014, pp. 265-73. DOI.org (Crossref), <https://doi.org/10.1177/1941738113508917>.
- Adachi, Nobuo, et al. "Intra-Articular Osteoid Osteoma of the Lateral Tibial Plateau Treated with Arthroscopically Assisted Removal and Retrograde Osteochondral Grafting." *The Knee*, vol. 21, no. 1, Jan. 2014, pp. 343-48. DOI.org (Crossref), <https://doi.org/10.1016/j.knee.2013.08.005>.
- Kitay, Allison, et al. "Osteochondral Autograft Transplantation Surgery for Metacarpal Head Defects." *The Journal of Hand Surgery*, vol. 43, no. 3, Mar. 2016, pp. 457-63. DOI.org (Crossref), <https://doi.org/10.1016/j.jhsa.2015.12.021>.
- Bae, Donald S., et al. "Early Results of Single-Plug Autologous Osteochondral Grafting for Osteochondritis Dissecans of the Capitulum in Adolescents." *Journal of Pediatric Orthopaedics*, vol. 40, no. 2, Feb. 2020, pp. 78-85. DOI.org (Crossref), <https://doi.org/10.1097/BPO.0000000000001114>.
- Zlotolow, Dan A., and Donald S. Bae. "Osteochondral Autograft Transplantation in the Elbow." *The Journal of Hand Surgery*, vol. 39, no. 2, Feb. 2014, pp. 368-72. DOI.org (Crossref), <https://doi.org/10.1016/j.jhsa.2013.09.003>.