Management of Bone Defects in Primary Knee Arthroplasty: A Case Report

1,3*Jean Nsunzel Kumasamba, 2Aurelie Mandoko Ekomisa, 2,3Josué Matadi Mukengeshai and 3Christian Kapinga Kane

1Orthopaedic Surgeon, Life the Glynnwood, Benoni, South Africa
2Surgery Department, University Hospital of Kinshasa, DRC
3Surgeon, Centre Hospitalier Initiative Plus, Kinshasa, Congo-Kinshasa

*Corresponding Author Email: kumajbk04@yahoo.com

Received: November 07, 2023 Accepted: November 25, 2023 Published: December 02, 2023

Abstract
A 66-year-old man presented to our clinic with chronic pain, varus deformity, and significant functional limitation in his right knee. He was clinically diagnosed with knee osteoarthritis, confirmed by standard frontal and lateral radiographs. Intraoperatively, we found a bone defect on the posteromedial aspect of the tibia that was filled with a bone graft and stabilised with a screw. Postoperative radiographs confirmed the stability of the prosthesis and consolidation of the bone graft. No major complications were observed during the follow-up period.

Keywords: Knee Osteoarthritis, Arthroplasty, Bone Graft, Screw.

Introduction
Knee osteoarthritis is a common joint condition characterized by the degeneration of articular cartilage. Severe deformity in osteoarthritis is often associated with uncontained tibial bone loss (Gaudon et al., 2018). Bone defects can compromise the durability, support, or stabilization of implants and create a significant challenge for surgeons in primary knee arthroplasty (Ozcan et al., 2021). There are several options to treat tibial bone defects during total knee arthroplasty (Gaudon et al., 2018). Generally, bone defects less than 5 mm deep are filled with bone cement, while defects of 5 to 10 mm deep are treated with bone grafts. When defects are ≥ 10 mm deep, management can be difficult. So plaining is very important (Iwase et al., 2022).

Observation
A 66-year-old man presented to our clinic with chronic pain, varus deformity, and significant functional limitation in his right knee. He was clinically diagnosed with knee osteoarthritis, confirmed by standard frontal and lateral radiographs. After a comprehensive evaluation of the patient, a decision was made to proceed with total knee arthroplasty. The procedure was done under local regional anaesthesia. The approach was midline medial parapatellar. Soft tissue release was done. There was a defect on the posteromedial aspect of the tibia ±10mm, distal femur and proximal tibia cut done. Tibia cut was done, keeping flush to lowest point of the defect. Defect in the posterior tibia could not be filled with bone graft only. All cut were completed. The tibia defect was filled with bone graft and stabilised with screw. The final implantation of cemented total knee replacement was completed.

The patient was followed up long-term after surgery, with regular evaluations of joint function, pain, and radiographs. Clinical outcomes showed a significant improvement in pain and joint function. Postoperative radiographs confirmed the stability of the prosthesis and consolidation of the bone graft. No major complications were observed during the follow-up period.

Discussion
Treating bone defects associated with knee osteoarthritis poses a challenge for orthopedic surgeons. There are two types of bone defects in the proximal medial tibia:

- Contained defects, where preservation of the cortical rim can support the tibial prosthesis.
Uncontained defects, without the cortical rim, which cannot support the prosthesis. These are often observed in patients with severe varus deformities or during revision arthroplasty (Dorr et al., 2006; Ozcan et al., 2021; Iwase et al., 2022).

In our case, we had a 66-year-old patient with a severe varus deformity, and x-ray showing an uncontained defects. CT scan wasn't done preoperatively. Several studies have demonstrated the advantages of bone grafting in treating bone defects associated with total knee arthroplasty. Bone grafting helps fill the bone defects, improve prosthesis fixation, and promote bone regeneration (Gaudon et al., 2018; Ozcan et al., 2021; Iwase et al., 2022). Dorr et al., (2006) found that repairing bone defects with bone cement was inadequate and encouraged the use of bone grafting as a useful treatment method (Iwase et al., 2022). Métal augment could have been used as an option as well but metal augment doesn't promote bone regeneration and the cost and availability could be prohibitive. In our case, we had a bone defect >10 mm, and the patient had a varus deformity.

The literature describes that the management of the proximal medial tibial bone defect in varus knees undergoing primary total knee arthroplasty can be done through cement augmentation, metallic wedges, and autogenous bone grafting (Iwase et al., 2022). In our case, we had a patient with a severe varus knee, who had a bone defect >10 mm, and we filled the bone defect with autogenous bone grafting and stabilized the graft with screw fixation. We then restored the joint with a cemented total knee prosthesis. The technique of bone cement with screw augmentation was initially introduced by Freeman et al., (1982) for managing tibial bone defects encountered during total knee arthroplasty, before being popularized by Ritter in 1986.

Relevant scientific references support the effectiveness of this treatment approach, offering significant improvement in pain and joint function. Long-term follow-up is essential to assess the stability of the achieved results (Gaudon et al., 2018; Ozcan et al., 2021). In our case, the patient was followed up long-term after surgery, with regular evaluations of joint function, pain, and radiographs. Clinical outcomes showed a significant improvement in pain and joint function. Postoperative radiographs confirmed the stability of the prosthesis and consolidation of the bone graft. No major complications were observed during the follow-up period. Even though the concern is about bone resorption before incorporation, this did not occur so far in our case report.

Figure 1. Bone grafting and screw fixation.

Figure 2. Tibial implant replacement.
Conclusion
Total knee arthroplasty with bone grafting and screw fixation can be an effective option for treating bone defects associated with knee osteoarthritis as long as it is a small defect. This surgical approach improves stability, joint function, and quality of life for patients.

Declarations
Acknowledgments: Thanks for the opportunity given to us by Dr. Ntalaja and CHIP Hospital without their support and guidance this work could not be possible. I cannot thank enough Dr. Ekomisa for your guidance.

Author Contributions: JNK-Management and surgical operator and work design; AME-Work writing and surgery actress; JMM-Proofreading of the work; CKK-Proofreading of the work.

Conflict of Interest: The authors declare no conflict of interest.

Consent to Publish: The authors agree to publish the paper in International Journal of Recent Innovations in Academic Research.

Data Availability Statement: All data relevant to the case report are included in the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: This work was approved by the committee of the Centre Interdisciplinaire de Recherche en Imagerie Médicale (CIRIMED) and validated under the number CIRIMED/0016/023.

Informed Consent Statement: Informed consent has been obtained from the patient to publish this case report and accompanying images.

Research Content: The research content of manuscript is original and has not been published elsewhere.
References

Copyright: ©2023 Jean Nsunzel Kumasamba, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.