

A Rare Complication of Medial Femoral Condyle Fracture During Total Knee Replacement Surgery: A Case Report

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ABSTRACT

Intraoperative femoral condyle fractures during primary total knee arthroplasty (TKA) are exceedingly rare complications, with limited cases reported in the literature. These fractures pose significant challenges, requiring immediate and meticulous surgical intervention to ensure optimal outcomes. This case report highlights a rare instance of an intraoperative medial femoral condyle fracture encountered during TKA surgery, discussing its management and outcomes. Here we present a 59-year-old female with Kellgren-Lawrence grade IV bilateral knee osteoarthritis underwent right total knee arthroplasty. During the procedure, an avulsion fracture of the medial femoral condyle occurred while evaluating tibial and femoral component stability. The fracture was managed intraoperatively using two cancellous fully threaded screws with washers, achieving successful stabilization. Postoperative stability tests confirmed satisfactory results, and the patient underwent a tailored rehabilitation program. Radiological follow-up showed favorable outcomes, with the fracture healing adequately and the knee maintaining functional stability. This report adds to the

limited data on intraoperative medial femoral condyle fractures during TKA and emphasizes the need for advanced planning, careful execution, and appropriate postoperative rehabilitation to ensure successful patient outcomes.

Keywords: Intraoperative fracture, Medial femoral condyle, Total knee arthroplasty, Surgical complication.

INTRODUCTION

With an increase in demand and the number total knee arthroplasty (TKA) performed worldwide, even the rare complications are frequently encountered in daily practice. Common complications associated with primary TKA include aseptic loosening, infection, polyethylene wear, stiffness, and periprosthetic fracture.¹ The post-operative periprosthetic fracture after TKA is a well-documented and potentially devastating complication adversely affecting the outcome.²

However, intraoperative fractures in primary TKA are rare and there are limited clinical data available in the literature on this topic.^{3,4} Intraoperative femoral condyle fracture is commonly described during posterior-stabilized (PS) TKA attributing to

excessive box cut or osteoporotic bone.²⁻⁴ These can occur at any step during TKA including surgical exposure, bony preparation, component trial, cementation, insertion of the final components, and seating of the polyethylene insert.³⁻⁵ Various treatment options are available and include observation, internal fixation using screws, plating, the use of stems and augments, increasing constraint of the prosthesis, and modifying the post-operative rehabilitation.²⁻⁴

This report adds to the limited literature on intraoperative femoral condyle fracture during total knee replacement surgery and highlights the importance of careful surgical technique to prevent this rare but significant complication.

CASE PRESENTATION

A 59-year-old female with bilateral knee osteoarthritis Kellgren-Lawrence grade IV underwent right total knee replacement surgery of her right knee. The patient's condition had progressed to the point where surgical intervention was deemed necessary to improve her quality of life and reduce pain and disability. The decision for a total knee replacement was made after considering her age, overall health, and the severity of her knee osteoarthritis. The clinical picture of the patient's knee is shown in Figure 1. Otherwise, The pre-operative x-ray of both knees showing Kellgren-Lawrence grade IV is elaborated in Figure 2.



Figure 1. The clinical picture of patient's knees in standing position: A) right lateral, B) anterior, C) posterior, D) left lateral; and supine position: E) full extension, F) full flexion views

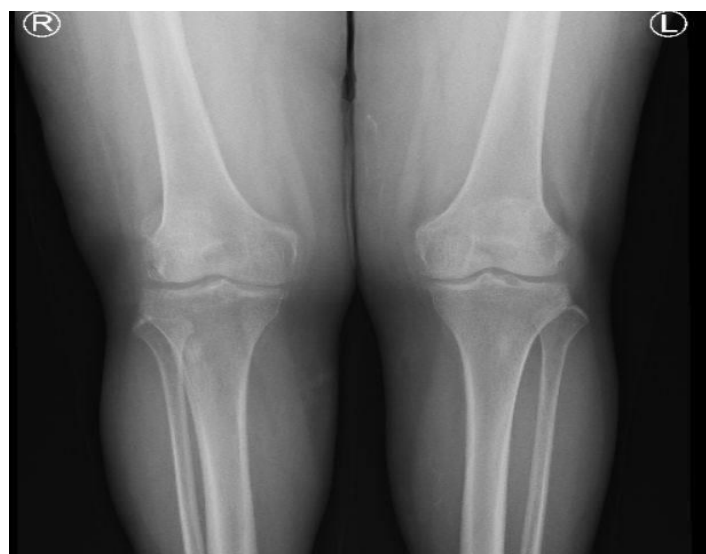


Figure 2. Pre-operative x-ray of both knees showing KL grade IV osteoarthritis

During the surgical procedure, as part of the standard evaluation of the stability of the tibial and femoral components, an unforeseen and extremely rare complication occurred. The patient suffered an avulsion

fracture of the medial condyle of the femur (figure 3). This complication posed a unique challenge to the surgical team, as it required immediate attention and careful handling to ensure a successful outcome.



Figure 3. Intra-operative image showing avulsion fracture of medial femoral condyle

To address the avulsion fracture, the surgical team decided to utilize two sets of cancellous fully threaded screws, each accompanied by a washer, to stabilize the fractured medial condyle (figure 4). The

screws, sized 75mm and 65mm respectively, were meticulously inserted through the fractured area to securely hold the bone fragments in place and promote proper healing.



Figure 4. Two sets of screws were inserted.

Following the fixation of the avulsion fracture, the stability of the knee was thoroughly re-evaluated through various stress tests. These included assessments for varus and valgus forces, as well as tests to examine the stability during knee extension and flexion. The postoperative evaluation demonstrated favourable results, as the knee joint remained stable throughout these tests. With the successful stabilization of the avulsion fracture and the overall stability of the knee joint confirmed, the patient was closely monitored during the postoperative period. The surgical team provided comprehensive postoperative care and rehabilitation protocols to ensure proper healing, recovery, and functional restoration of the affected knee. Despite the unforeseen

and challenging complication during the total knee replacement surgery, the patient responded well to treatment, and her postoperative recovery progressed satisfactorily. Regular follow-up appointments were scheduled to monitor the patient's progress, and appropriate adjustments to the rehabilitation program were made as needed to promote optimal outcomes and improve her long-term quality of life. The case of an avulsion fracture of the medial condyle of the femur during total knee replacement highlights the importance of vigilance, quick decision-making, and skilful handling of unforeseen complications in complex orthopedic surgeries. The post-operative x-ray evaluation of right knee is shown in Figure 5.

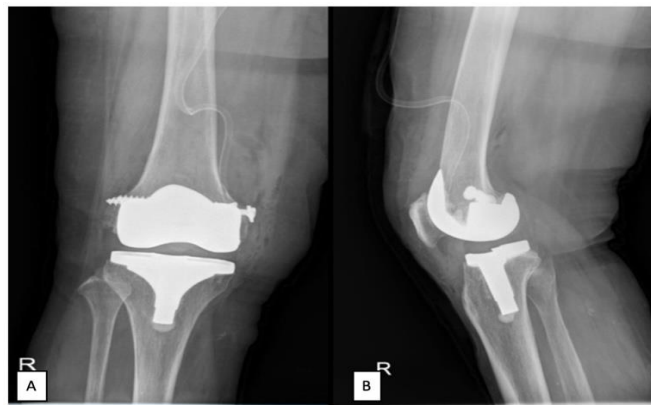


Figure 5. Post-operative x-ray of right knee: A) anteroposterior view; B) lateral view

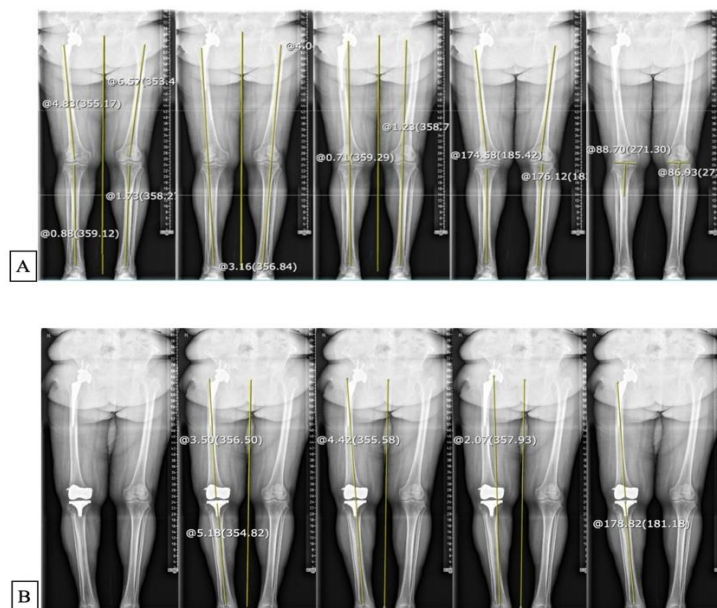


Figure 6. Post-operative x-ray



Figure 7. Post-operative x-ray

DISCUSSION

Intraoperative femoral condyle fracture is a rare but significant complication during primary TKA. The incidence of intraoperative fracture during primary TKA is 0.39% and more commonly occur in women.¹ The intercondylar notch cut acts as a stress riser by decreasing the strength of the femoral condylar bone stock, thus increasing the risk of fracture.⁴ Studies have reported that intraoperative femoral fractures are associated with PS knee surgery and the medial condyles are more commonly affected.⁴ Pun et al. reported that of the femoral fractures identified, 80% were avulsion fractures in the coronal plane of the medial femoral condyles, which occurred during removal of the intercondylar notch because of an incomplete sagittal cut between the intercondylar notch and medial femoral condyle.⁴ Agarwala et al. reported that of the femoral fractures identified, 75% occurred during removal of the intercondylar notch bone and trialing.⁴ In a case-control study in the Asian population, intraoperative femoral condyle fracture was reported as a significant complication during primary TKA.³ The study reported that the fracture occurred more commonly in women and in patients with a higher body mass index.⁵ A medial femoral condyle fracture is a rare complication of TKA. According to a case report, only two intraoperative cases of medial femoral condyle fracture have been reported in the literature.⁶

The presented case report highlights an unfortunate and rare complication of total knee replacement surgery, namely an intra-

operative medial femoral condyle fracture. Based on the analysis of the presented case and a review of the available literature, it is evident that intra-operative medial femoral condyle fractures are infrequent but significant events during total knee replacement surgery. These fractures may occur due to various factors, such as osteoporosis, bone quality, surgical technique, or implant-related issues. The specific mechanism leading to the fracture in this case could not be conclusively determined.⁶

Early recognition of the fracture during surgery is crucial for timely intervention and optimal patient outcomes.⁷ Surgical management options include internal fixation, revision total knee arthroplasty, or the use of specialized implants designed to address the fracture pattern. The choice of treatment should be individualized, considering the patient's age, bone quality, implant stability, and surgeon experience.^{7,8} In a review by Mak et al. (2020), intraoperative TKA fractures occurred in 1.04 % of 2682 consecutive primary TKAs performed at a high-volume center, with the majority of fractures occurring at the femoral condyle (82.1%). The increased incidence of femoral condyle fractures may have multiple causes. Patient factors such as osteoporosis, female gender, and small stature are disadvantageous. Large/wide box incision in posterior stabilized TKA, pin-track positioning, and computer navigation assisted TKA (pin track) can be associated with implant/instrument factors. Technical factors such as insufficient/excessive/eccentric box cut, eccentric/angular trial

insertion or removal, and excessive hammering force.⁹

Femoral fractures in the medial femoral condyles are primarily caused by avulsion fractures, which occur during removal of the intercondylar notch. Agarwala et al. found 75% of femoral fractures during removal and trialing.¹⁰ Alden et al. found 39% of fractures during exposure and bone preparation¹¹, while Pinaroli et al. reported 9 non-displaced femoral condyle fractures during impaction of the PS femoral implant.¹² Delasotta et al. reported 50% of femoral fractures during trialing and final implantation.¹³ Agarwala et al. found 53% of tibial fractures during placement of the final cemented component, with overzealous hammering being a significant risk factor for intra-operative tibial fractures.¹⁰

Post-operatively, patients with intra-operative medial femoral condyle fractures may experience prolonged rehabilitation and recovery periods. The rehabilitation process should be closely monitored and tailored to ensure early mobilization while avoiding excessive stress on the healing fracture site.¹⁴

CONCLUSION

The presented case underscores the importance of meticulous preoperative planning, careful surgical technique, and a high index of suspicion for potential complications during total knee replacement surgery. Surgeons should be prepared to manage intra-operative fractures promptly and effectively to minimize adverse effects on patient outcomes.

Overall, while the management of an intra-operative medial femoral condyle fracture can be challenging, it is possible to achieve successful outcomes with appropriate preoperative assessment, intraoperative meticulous technique, and postoperative rehabilitation. Continued research and reporting of such cases will aid in refining surgical techniques and advancing the field of orthopaedic surgery for the benefit of patients undergoing total knee replacement.

Declaration by Authors

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