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Simultaneous anterior cruciate ligament repair and medial unicompartmental knee replacement

Deepak Gautam, Naman Wahal, Rajesh Malhotra, Vijay Kumar

Abstract:

We present the case of a 55-year-old female who sustained avulsion of anterior cruciate ligament (ACL) from its tibial attachment while undergoing unicompartmental knee replacement (UKR). The fibers of ACL were intact. Realizing the paramount importance of ACL in a knee undergoing UKR, we promptly performed a primary repair of the ACL and continued with the surgery in the same sitting. At the latest follow-up, the patient is doing well both clinically and functionally and has no antero-posterior or varus-valgus laxity. We discuss the cause for ACL avulsion during UKR and precautions to avoid it.

Keywords:

Avulsion of anterior cruciate ligament, intraoperative, unicondylar knee replacement, unicompartmental knee replacement

Introduction

Unicompartmental knee replacement (UKR) is a valuable option in patients with symptomatic anteromedial osteoarthritis of the knee joint. Once restricted to younger age group in the past, it has now been popularly used in the elderly population as well. It has significantly low morbidity and overall cost to the patient when compared with total knee replacement (TKR).^[1-4]

Case Report

A 55-year-old female presented with pain in her left knee for 3 years. She was investigated using radiographic stress views which revealed the diagnosis to be anteromedial osteoarthritis of the left knee joint.^[2,5] Her clinical examination and stress radiographs [Figure 1] suggested her suitability for implantation of medial unicompartmental knee prosthesis. Considering the clinical presentation, age and severity of the disease, she was planned for the left UKR. During

surgery, she sustained an avulsion of the anterior cruciate ligament (ACL) from its tibial attachment while performing the tibial cut. However, the ACL fibers were intact. Realizing the paramount importance of in a knee undergoing UKR, the avulsed tibial attachment was promptly repaired using Ethibond® (polyethylene terephthalate) sutures [Figure 2a]. Rest of the surgery was uneventful. Postoperatively, the patient was mobilized on the first postoperative day with in-bed closed chain exercises and a knee brace while walking. The knee brace was given for a period of 3 weeks and then discontinued.

At the latest follow-up of 1 year, the patient has excellent clinical and functional outcome without any antero-posterior or varus-valgus laxity. The latest radiographs show intact prosthesis *in situ* with no signs of ACL laxity [Figure 2b and c].

Discussion

In the authors' knowledge, until date no such intraoperative complication of the UKR surgery, wherein the intraoperative avulsion

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Department of
Orthopedics, All India
Institute of Medical
Sciences, New Delhi, India

Address for correspondence:

Prof. Rajesh Malhotra,
Department of
Orthopedics, All India
Institute of Medical
Sciences, Ansari Nagar,
New Delhi - 110 029,
India.
E-mail: cmcdeepak@
yahoo.com

of ACL was repaired promptly and successfully, has been reported. A failure to repair the same intraoperatively would have left only two alternatives; either conversion to TKR thereby increasing morbidity or do a UKR in an ACL-deficient knee only to make it more prone to revision.^[1,6]

The presence of a functionally intact ACL is accepted as a universal prerequisite for UKR^[7] along with the presence of collateral ligaments. In a case series of 103 cases of the UKR, a revision rate of 21.4% was reported when it was done in ACL deficient knees.^[6,7] The anteroposterior translation of tibia that results from the deficient ACL results in excessive loading at the extremes of the tibial component resulting in “rocking” of the implant. To prevent this translation, the simultaneous contraction of quadriceps and the hamstrings lead to excessive contact forces over the implant further contributing to loosening.^[6] Hence, it seems logical that while using a mobile bearing unconstrained implant for UKR, the absence of ligamentous constraints provided by the anterior and the posterior cruciates and collateral ligaments leads to increased rates of failure. Thus, the absence of an intact and functional ACL is detrimental to the successful outcome of UKR.

Apart from the failure of the tibial implant due to the absence of ACL, the concept of replacement of a single compartment of the knee in the UKR surgery itself can be a complete failure as the osteoarthritis may progress to other compartments as well following ACL deficiency. Mullaji *et al.*, conclusively showed that the rupture of ACL is crucial to progression of the osteoarthritis from anteromedial to posteromedial compartment.^[8] Considering such facts Pandit *et al.*, combined the procedure of ACL reconstruction with UKR and reported excellent outcome.^[9] However, in the best of author’s knowledge, there is no study performed until date that combines an ACL repair for an intraoperative avulsion with UKR.

In the current case, the inefficient control over the use of the saw blade and design of the tibial cutting jig with inadequate protection on the lateral side were the main reasons for the avulsion of ACL [Figure 3]. In the case of Oxford Unicompartmental knee replacement, the balancing is made by bone cuts rather than soft tissue, so the bone cuts should be made precise.^[2] UKR is considered “surgically more demanding” than the TKR.^[10,11] Although the failures are common in low volume surgeons, intraoperative handling of instruments and skill of the surgeons also affect the surgery.^[10] The saw blade should be firmly held to prevent deflection [Figure 3a]. A medial collateral ligament (MCL) protector can be used in the medial side to protect the medial structures [Figure 3b]. However, the Oxford medial UKR tibial cutting jig (sim)

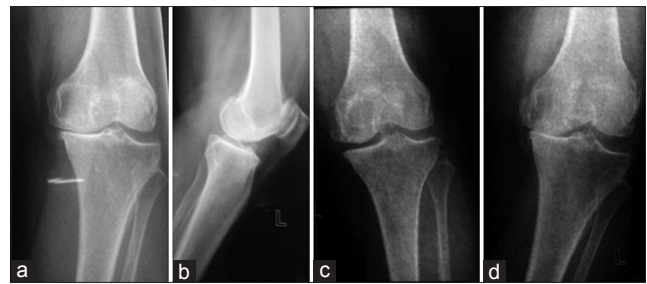


Figure 1: Preoperative radiographs of the patient. (a) Antero-posterior view of left knee showing complete loss of joint space in the medial compartment; however, the lateral compartment is intact. (b) Lateral view showing femoral condyles centered over the tibial plateau suggestive of intact ACL.^[6] (c) Valgus stress view showing opening of the medial joint space, correction of the varus deformity on stress and a maintained lateral compartment. (d) Varus stress view showing bone on bone obliteration of medial joint space

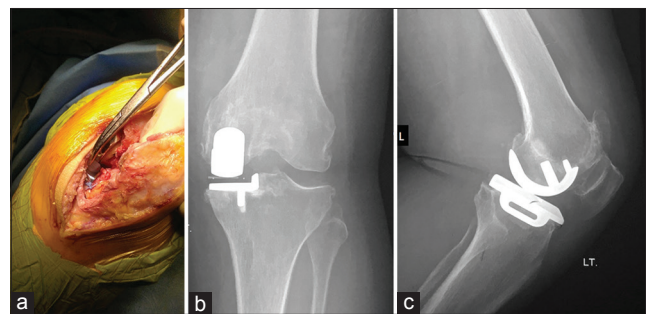


Figure 2: (a) Intraoperative picture showing the repair of avulsed anterior cruciate ligament using the using Ethibond suture. (b) Postoperative radiographs of the left knee in antero-posterior view showing the Oxford unicompartmental knee prosthesis *in situ*. (c) Lateral view showing the prosthesis *in situ* with no signs of anterior cruciate ligament laxity

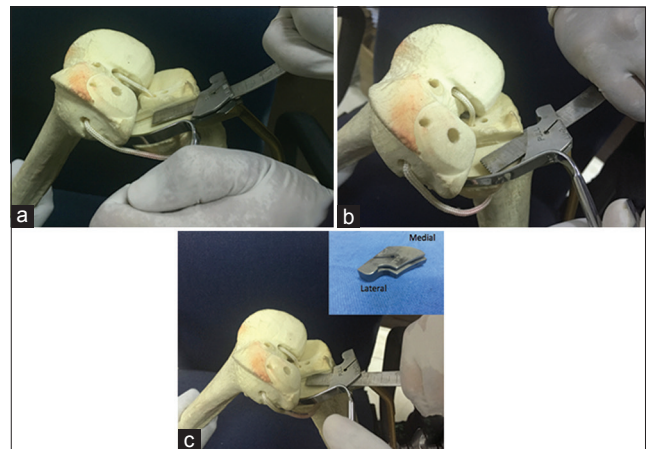


Figure 3: Saw bone model showing tibial cuts during unicompartmental knee replacement. (a) The saw blade should be held firmly to prevent deflection. (b) A medial collateral ligament protector keeps medial structures safe. (c) The blade can inadvertently drift laterally compromising bony attachment of anterior cruciate ligament (inset - showing the tibial jig [shim] which has incomplete guard on the lateral side so there is high risk of the saw blade skidding into the lateral compartment thus injuring the tibial attachment of anterior cruciate ligament)

has not a complete lateral protection in it so the saw blade can inadvertently drift laterally compromising bony attachment of ACL [Figure 3c]. Care should be taken

while handling the lateral side so that the blade would not compromise the tibial attachment of ACL.

Simultaneous ACL repair with UKR gave us a lot of advantages. First, the patient was relatively younger and more suited for a UKR because TKR in such a patient would lead to a lot of bone loss and a complicated revision surgery the later years of her life. Second proceeding with a UKR in the absence of a functionally intact ACL would lead to a higher chance of tibial implant failure as explained earlier. Third, proceeding with a TKR and risking higher morbidity rates seemed illogical as only the anteromedial compartment of the knee was osteoarthritic. Fourth, repair of avulsed ACL was successful at the latest follow-up rendering the patient with excellent functional and clinical outcome. Thus, simultaneous repair of ACL and UKR can be one of the treatments to manage the complication of avulsion of ACL during medical UKR.

Conclusion

The presence of a functionally intact ACL is a prerequisite for the UKR surgery. Therefore, the surgeon should be careful about the avulsion of ACL as a possible intraoperative complication and should be ready to repair it if possible, i.e., if the fibers are intact. A simultaneously done ACL repair is a rational treatment for such an intraoperative complication. The above report might influence a newer and a better change in the tibial cutting guides of the Oxford mobile bearing medial unicompartmental knee prosthesis.

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Conflicts of interest

There are no conflicts of interest.

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