Irreducible Knee Dislocation with Vastus Medialis Muscle Interposition

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Knee dislocation is one of the rare orthopedic emergencies that require special management with an annual incidence rate of less than 0.02%. Knee dislocations are classified by Kennedy, according to the direction of tibial dislocation in relation to the femur, as anteromedial, posteromedial, anterolateral, and posterolateral. Operative intervention and multi-ligament reconstruction are usually required in knee dislocation. Interposition of the vastus medialis inside the joint of a dislocated knee is an uncommon scenario where reduction becomes impossible. In this report, we present a case of irreducible knee dislocation with vastus medialis muscle interposition. Before reduction, we performed arthroscopy of the knee and removal of the interposed muscle to prevent extravasation of the fluid by sealing the torn capsular area.

Keywords: Knee, Dislocation, Vastus medialis, Interposition

Knee dislocation is a rare orthopedic emergency that requires special care. The incidence of knee dislocation is estimated to be low, accounting for less than 0.02% of the total number of annual trauma episodes¹⁾. The majority of knee dislocation injuries occur in high-energy trauma that causes stress in the anteroposterior direction in the sagittal plane of the knee and varus-valgus angulation in the frontal plane, inducing a rotational dislocation of the tibia in relation to the femoral condyles^{2,3)}.

Kennedy's classification of knee dislocations is based on the direction of tibial dislocation in relation to the femur, such as anteromedial, posteromedial, anterolateral, and posterolateral⁴⁾. Posterolateral rotatory dislocation occurs infrequently and most

of the cases are considered irreducible by closed reduction because of incarceration of soft tissues, such as the medial capsule, retinaculum, vastus medialis muscle, and medial meniscus⁵⁾. The 'Pucker sign' or 'Dimple sign' is a physical characteristic of irreducible knee dislocation, which is caused by invagination of the skin and soft tissues into the medial joint space⁶⁾.

Case Report

A healthy 28-year-old man had a high-velocity motor vehicle accident. The patient was ejected from the car and was reported to have lost consciousness. He was injury-free except for the following orthopedic conditions: right inferior and superior pubic rami fractures, right sacral bone fracture, left mid-shaft femur fracture, and right knee dislocation. Clinical assessment revealed the right knee was in a flexion and valgus position with a lateral subluxation of the patella. The presence of a medial skin furrow was considered as a sign of irreducibility. Range of motion assessment and special tests for right knee stability could not be performed due to pain. Distal neurovascular assessments showed no compromise and the skin condition was normal. Serial ankle-brachial index was normal and computed tomography angiography was not required, as per the advice of the vascular surgeon. X-ray results showed posterolateral dislocation and magnetic

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resonance imaging (MRI) results showed multiple ligamentous injuries involving the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), lateral collateral ligament (LCL), and medial collateral ligament (MCL) (Fig. 1). MRI of the right knee also showed interposition of the vastus medialis; therefore, complete knee reduction was not feasible (Fig. 2).

Typically, knee dislocation requires urgent reduction in the

emergency room. Unfortunately, in this case, reduction was impossible. Therefore, a temporary spanning external fixator was applied until the other fractures were fixed to limit pain and increase patient mobility.

After treatment of the other fractures, a complete preoperative plan was formed. The patient first underwent gravity flow diagnostic arthroscopy, followed by debridement of the ACL and

Fig. 1. Anteroposterior (A) and lateral (B) X-rays taken before reduction and fixation.

Fig. 2. Coronal (A) and sagittal (B) magnetic resonance imaging scans taken before reduction and fixation, showing the interposed vastus medialis muscle.

Fig. 3. Anteroposterior (A) and lateral (B) X-rays taken after reduction and fixation.

PCL stumps. Drilling of ACL and PCL tunnels was performed using the all-inside technique, by passing the sutures through the tunnel to retrieve the graft later. Subsequently, a skin incision was made over the posteromedial side of the knee and the herniated vastus medialis muscle was removed using a finger for knee reduction. The grafts were passed through the tunnels to restore the anatomical positions of the ACL and PCL, and the ligaments were then tensioned in a standard manner. The PCL was tensioned at 90° of knee flexion, ensuring reproduction of the anteromedial step-off; the ACL graft was tensioned at a near-extension knee position. In the same operation, reconstruction of the extra-capsular ligaments, LCL, and MCL were performed using an open technique (Fig. 3). The patient tolerated the procedure very well and the knee was placed in a hinge brace locked from 0° to 90° and locked in extension during ambulation. Post-operatively, the patient started prone rehabilitation as per the PCL protocol and showed improvement within weeks. In subsequent visits (12 weeks after surgery), the patient was able to walk freely without walking aids. Physical examination based on stress tests of the ACL, PCL, MCL, and LCL showed that he achieved a good functional range of motion with good stability.

Discussion

To the best of our knowledge, there have been only three reported cases of posterolateral knee dislocation with interposition of the vastus medialis muscle⁷⁻⁹. In these studies, knee dislocation was an isolated injury and was not a result of multiple traumas, unlike our present study. We presented a case of posterolateral knee dislocation with an interposition of the vastus medialis muscle. In our case, arthroscopy of the knee and removal of the interposed muscle were done before reduction, which prevented extravasation of fluids by sealing the torn capsular area. Unlike previously reported cases that used the traditional technique, we performed reconstruction of the intra-articular ligaments (ACL and PCL) using the all-inside technique with retrograde drilling, which is a minimally invasive, bone-preserving procedure that uses a suspensory device for fixation of ligaments.

Although well documented, irreducible posterolateral dislocation of the knee joint is considered to be a rare complication. It is important to recognize and treat this condition promptly because it cannot be reduced by closed methods. In our case, surgery was necessary because the interposition of abundant soft tissue inside the enlarged joint space prevented reduction of the dislocation. Reduction was not performed immediately because the patient had other life-threatening fractures. The patient had no neuro-

logical or vascular injury that required immediate surgical exploration. A spanning external fixator was applied to maintain the knee before reconstruction. External fixation can be a valuable treatment option, particularly in patients with multiple traumas or vascular injury as it provides stability to the knee by maintaining the reduction, allowing healing of soft tissue¹⁰.

Some limitations of our study include the short-term follow-up and the lack of objective stability results (using the KT-arthrometer; MEDmetric Corp., San Diego, CA, USA) and clinical scores. However, our study described a rare knee-dislocation case with a good outcome.

In conclusion, knee dislocation is a challenging orthopedic emergency that needs good preoperative planning. We have presented a positive treatment outcome of a multiple trauma patient who showed irreducible knee dislocation with soft tissue trapped inside the joint and vastus medialis interposition.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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