

Arthroscopic Reduction of Irreducible Posterolateral Knee Dislocation with Interposition of the Vastus Medialis: A Case Report

Jae-Ang Sim, M.D., Byung-Kag Kim, M.D., Beom-Koo Lee, M.D.,
Yong-Cheol Yoon, M.D., Eun-Suk Choi, M.D.

Department of Orthopedic Surgery, Gil Medical Center, Gachon University of Medicine and Science, Incheon, Korea

Irreducible traumatic knee dislocation is rare. The knee dislocation is classified depending on the incarcerated structures. Complete reduction is achieved by extracting the incarcerated structure. Several reports introduce the reduction of irreducible traumatic knee dislocation by open surgery or arthroscopy. This case describes irreducible posterolateral knee dislocation with interposition of the vastus medialis. Closed reduction failed in the emergency room, and complete reduction was attained by arthroscopically sectioning the muscle and fascia of the vastus medialis in the intercondylar notch. [J Trauma Inj 2016; 29: 167-171]

Key Words: Knee, Dislocation, Vastus medialis

I. Introduction

Knee dislocation is rare and is an orthopedic emergency case. Most knee dislocations occur due to high energy injury. It is important to reduce knee dislocation as soon as possible to prevent secondary vascular and nerve injury. After reduction, care should be taken to sequentially evaluate vascular and nervous system.(1-4) Generally, knee dislocation is easily reduced closed, but if the dislocation is irreducible, an aggressive method such as surgical reduction is required. Although most reduction can be accomplished by removing interposition of soft tissue through open surgery, reductions by arthroscopic debridement are sometimes possible.(5-10) This report introduces a case

of knee dislocation by low energy injury, which failed in closed reduction due to interposition of the vastus medialis, but attained complete reduction by arthroscopic reduction.

This study was approved by the Institutional Review Board (IRB) before commencing the study and agreed with the patient.

II. Case Report

A 53-year-old male was seen in the emergency room complaining of right knee joint pain and limited range of movement, started after a slip and fall in the toilet. Physical examination revealed a mild dimple sign, buttonholed medial femoral condyle and a

* Address for Correspondence : **Eun-Suk Choi, M.D.**

Department of Orthopedic Surgery, Gil Medical Center, Gachon University,
774 Beon-gil, 21 Namdong-daero, Incheon 21565, Korea
Tel : 82-32-460-3384, Fax : 82-32-468-5437, E-mail : es_choi@gilhospital.com

Submitted : September 20, 2016 **Revised** : November 27, 2016 **Accepted** : December 15, 2016

This study was approved by the Institutional Review Board (IRB) of Gil Medical Center, Gachon University before commencing the study.

knee locked at 30 degrees of flexion (Fig. 1). No vascular or nerve injury was observed by physical exam-

ination. Radiographic examination revealed widened medial joint space, posterolateral dislocation of tibia



Fig. 1. Pre-operative clinical photograph and simple radiographs. (A) Clinical photograph showed characteristic dimpling of skin (dimple sign, white arrow). (B) Simple radiographs revealed widening of medial joint space, lateral and distal displacement of patella, and posteriorly displaced tibia (C) After closed reduction, patellar and tibial subluxation remained on simple radiographs.

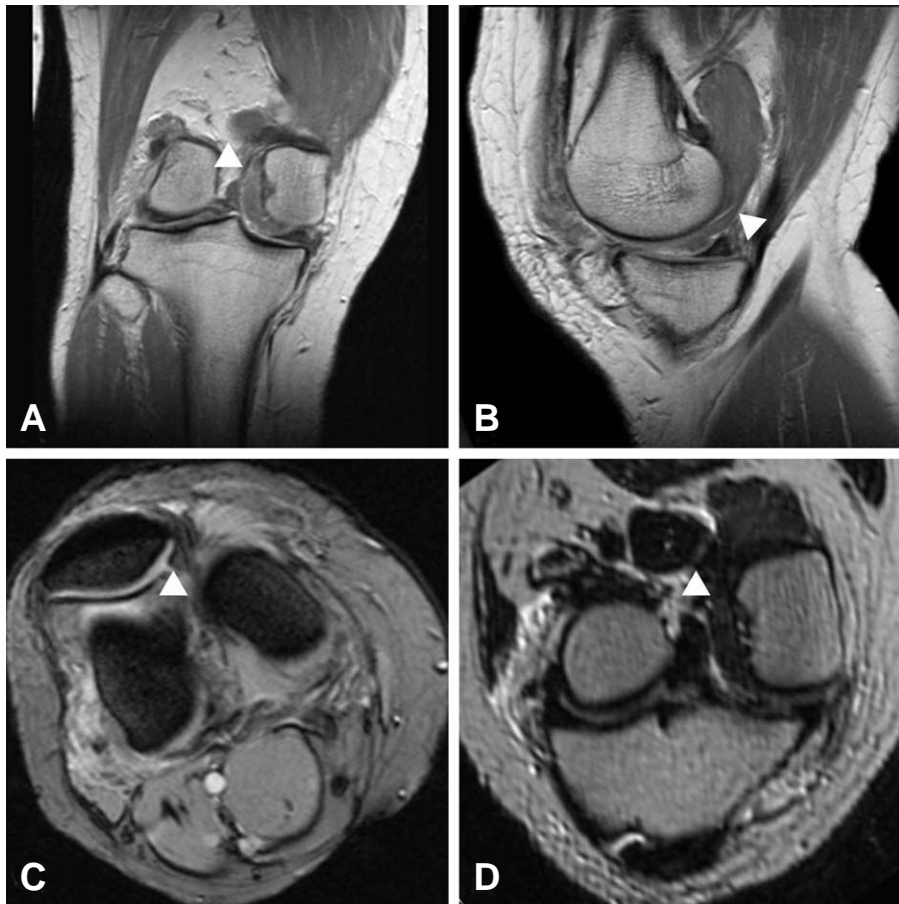


Fig. 2. Pre-operative MRI. MRI showed incarcerated structures (vastus medialis muscle and fascia, white arrow head) with low to intermediate signal intensity in the intercondylar notch. (A) Coronal plane (B) Sagittal plane (C) Axial plane (D) Oblique coronal plane.

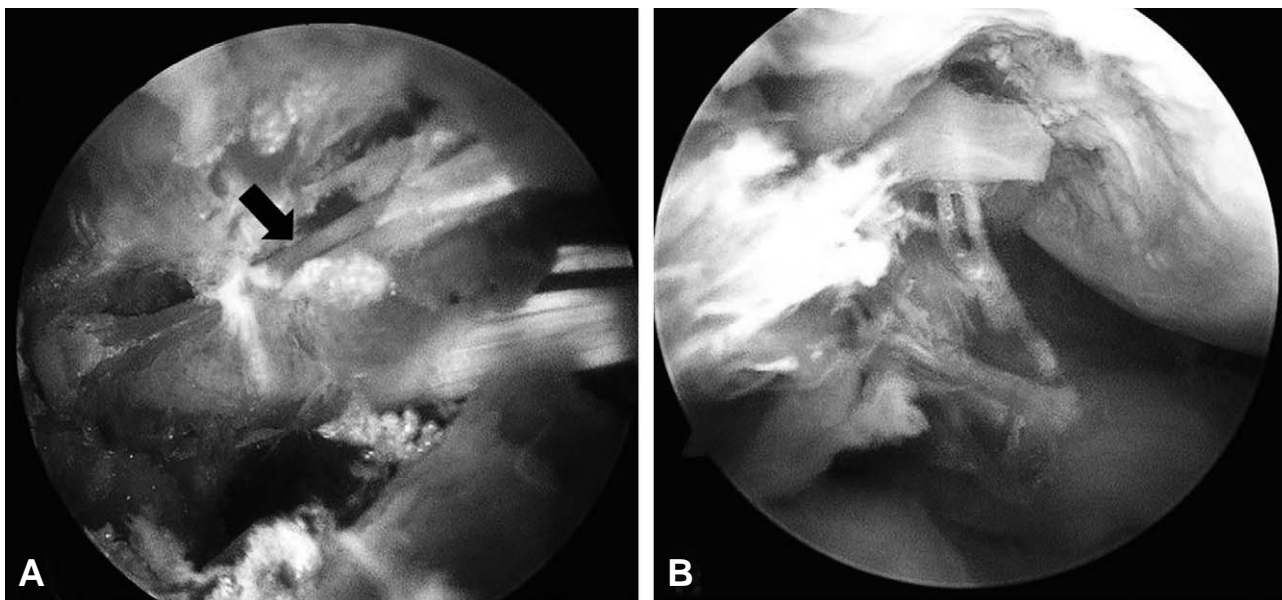


Fig. 3. Intra-operative arthroscopy. (A) Arthroscopic finding revealed incarcerated structures (vastus medialis muscle and fascia, black arrow) via anterolateral portal. (B) After removal of the incarcerated structures, ACL and PCL tears in the intercondylar notch were identifiable.



Fig. 4. Immediately post-operative simple radiographs. Complete reduction was achieved by removal of the muscle and fascia of the vastus medialis arthroscopically.

and lateral distal dislocation of patella (Fig. 1). After closed reduction in the emergency room, the widened medial joint space and location of the tibia were reduced, but there was still increased medial knee joint space and lateral distal dislocation of patella. We assumed it to be an irreducible knee dislocation with interposition of the soft tissue and examined it with MRI (Fig.

1). MRI findings showed that the anterior and posterior cruciate ligaments and medial collateral ligaments were ruptured completely, and the vastus medialis was incarcerated to intercondylar notch, interfering with the reduction (Fig. 2).

We concluded it to be an irreducible posterolateral knee dislocation with interposition of the vastus medialis and decided to try surgical reduction. Arthroscopic findings showed the interposition of muscle and fascia of the vastus medialis in the intercondylar notch as in the MRI findings. After arthroscopic excision of the muscle and fascia, we confirmed the reduction of the knee, and checked the complete rupture of the anterior and posterior cruciate ligament and medial collateral ligament (Fig. 3). Postoperative radiographic findings showed complete reduction of knee (Fig. 4), and although we recommended a staged ligament reconstruction, the patient wanted conservative treatment and is not very active, so we applied long leg cast immobilization for six weeks with the knee fully extended, followed with six weeks of motion and strengthening exercises with braces.

Only partial weight bearing with crutches was allowed for 12 weeks. One year after surgery, physical examination revealed mild instability and no limitation of movement or interference with daily activity. The Lysholm score showed good results at 85 points.

III. Discussion

Knee dislocation is an orthopedic emergency. It is a very rare orthopedic trauma seen at the rate of 0.2% but once it happens, treatment should start immediately.⁽¹¹⁾ The widely used Kennedy classification⁽¹²⁾ divides knee dislocation into anterior, posterior, medial, lateral or rotational dislocation depending on the dislocated direction of the tibia. Rotational dislocation is sub-classified into anteromedial, anterolateral, posteromedial or posterolateral rotational dislocation. Without rapid reduction, repetitive and careful evaluation and appropriate treatment of vascular injury, knee dislocations result in severe sequelae such as functional degradation, because most knee dislocation is caused by high energy damage and may be accompanied by serious complications such as vascular and nerve injury.⁽¹⁾ In our case, physical examination fortunately showed no vascular or nerve injury due to low energy injury and rapid reduction even incomplete reduction with interposition of the vastus medialis.

Knee dislocations, in most cases, are easily reduced closed due to the rupture of several ligaments but sometimes the intraarticular soft tissue interposition interferes with the reduction.⁽⁵⁻¹⁰⁾ Most irreducible knee dislocations are the type classified as posterolateral dislocation.^(8,9) The incarcerated structures that typically interfere with the reduction are the medial retinaculum, joint capsule, medial collateral ligament and muscles around the knee, and the medial collateral ligaments are the most common.⁽¹⁰⁾ Dimple sign and button holed medial femoral condyle are important findings that suggest an irreducible posterolateral dislocation in the physical examination.⁽⁸⁻¹⁰⁾ Additionally, if radiographic findings still show widened medial joint space and lateral distal subluxation of patella after closed reduction, irreducible posterolateral dislocation of the knee should be suspected. With this patient, all physical examination and radiographic results indicated posterolateral knee dislocation of the knee.

Because irreducible knee dislocations usually accompany extensive medial soft tissue and cruciate ligament injury, there are a number of interposing structures. Surgical reduction, accomplished mainly by removing the incarcerated soft tissue through the open

procedure, is considered the golden standard treatment.^(6,8-10) Nevertheless, in some cases, limited arthroscopic reduction has been attempted if there is not a wide range of soft tissue interposition.^(5,7) In our case, because only the muscle and fascia of the vastus medialis with low energy injury was interposed in the intercondylar notch interfering with the reduction, arthroscopic reduction was easily attained without open incision. Although recent treatment trends recommend early surgical treatment for multiple ligament injuries, the patient was treated conservatively because he is not very active and wanted conservative treatment rather than surgical treatment. After treatment with cast immobilization, braces, and muscle strengthening exercises, we obtained satisfactory clinical results. However, the recent systematic review still reported that operative treatment was better than conservative treatment in terms of functional scores, return to work, and return to full sport.⁽¹³⁾

Irreducible knee dislocations are very rare but serious injuries. Through accurate physical examination and radiographic examination, a prompt decision should be made whether reduction should be accomplished surgically or closed. With irreducible posterolateral knee dislocation with interposition of the muscle and fascia of the vastus medialis, reduction through arthroscopic resection should be considered a useful alternative to accomplish complete reduction of the knee.

IV. Conflict of Interest

The authors declare that they have no conflict of interest.

REFERENCES

- 1) Sim JA, Lee BK. Management of multiple ligament injured knee. *J Korean Orthop Soc Sports Med* 2013; 12: 16-23.
- 2) Stannard JP, Sheils TM, Lopez-Ben RR, McGwin G Jr, Robinson JT, Volgas DA. Vascular injuries in knee dislocations: the role of physical examination in determining the need for arteriography. *J Bone Joint Surg Am* 2004; 86: 910-5.
- 3) Mills WJ, Barei DP, McNair P. The value of the ankle-brachial index for diagnosing arterial injury after knee dislocation: a prospective study. *J Trauma* 2004; 56: 1261-5.
- 4) Hegyes MS, Richardson MW, Miller MD. Knee dislocation.

- Complications of nonoperative and operative management. *Clin Sports Med* 2000; 19: 519-43.
- 5) Jeong JY. Arthroscopic reduction of irreducible knee dislocation: a case report. *J of Korean Arthroscopy Soc* 2009; 13: 161-4.
 - 6) Jang KM, Lee HS, Wang JH. Open reduction of irreducible posterolateral rotary knee dislocation without sectioning of incarcerated vastus medialis: a case report with video illustration. *Knee* 2014; 21: 582-5.
 - 7) Dubberley J, Burnell C, Longstaffe A, MacDonald PB. Irreducible knee dislocation treated by arthroscopic debridement. *Arthroscopy* 2001; 17: 316-9.
 - 8) Urgüden M, Bilbaşar H, Ozenci AM, Akyildiz FF, Gür S. Irreducible posterolateral knee dislocation resulting from a low-energy trauma. *Arthroscopy* 2004; 20: 50-3.
 - 9) Cinar M, Derincek A, Akpınar S. Irreducible dislocation of the knee joint: two-stage treatment. *Acta Orthop Traumatol Turc* 2011; 45: 280-3.
 - 10) Kilicoglu O, Akman S, Demirhan M, Berkman M. Muscular buttonholing: an unusual cause of irreducible knee dislocation. *Arthroscopy* 2001; 17: E22.
 - 11) Robertson A, Nutton RW, Keating JF. Dislocation of the knee. *J Bone Joint Surg Br* 2006; 88: 706-11.
 - 12) Kennedy JC. Complete dislocation of the knee joint. *J Bone Joint Surg Am* 1963; 45: 889-904.
 - 13) Levy BA, Dajani KA, Whelan DB, Stannard JP, Fanelli GC, Stuart MJ et al. Decision making in the multiligament-injured knee: an evidence-based systematic review. *Arthroscopy* 2009; 25: 430-38.