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# A Rare Closed Reduction of Posterolateral Dislocation with Medial Collateral Ligament (MCL) Injury : A Case Report

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## Abstract

**Introduction:** Irreducible posterolateral dislocation of the knee is a rare condition. Due to limited reports available, it is a common dilemma whether closed reduction should be attempted at all or an open surgery is the only method. "Dimple Sign" can be found in the presence of injured medial structure, including the medial collateral ligament rupture (MCL), failure to recognize this sign may lead to repeated attempts of close manual reduction where could lead to secondary soft tissue injuries. **Case Report :** In this study we present a 50 years old male with successful attempt of closed reduction in posterolateral knee dislocation combined with tendon repair for the MCL rupture. **Conclusion:** This study may add more perspective and be beneficial for similar cases where prompt open surgery is not possible and closed reduction is considered.

**Keywords — closed reduction, Dimple Sign, irreducible, MCL rupture, posterolateral knee dislocation**

## Abstrak

**Pendahuluan:** Dislokasi posterolateral dari lutut yang tidak dapat direduksi merupakan kondisi jarang. Dikarenakan sedikitnya laporan kasus yang cukup jarang sering diperdebatkan apakah pada kasus ini dibutuhkan percobaan untuk reduksi tertutup atau langsung ditanganin dengan operasi secara terbuka merupakan metode satu-satunya. "Dimple Sign" merupakan sebuah tanda bila ada kelainan struktural pada sisi medial lutut, termasuk struktur medial collateral ligament (MCL), tanda ini merupakan pertanda bahwa percobaan reduksi tertutup yang berulang-ulang dapat merusak jaringan ikat secara sekunder. **Laporan kasus:** Pada penelitian ini kami mempresentasikan laki-laki berumur 50 tahun dengan percobaan reduksi tertutup yang berhasil pada dislokasi posterolateral patella dengan MCL rupture yang tendonnya diperbaiki. **Kesimpulan:** Penelitian ini dapat memberikan perspektif baru dan berguna pada kondisi dimana reduksi terbuka dengan operasi tidak dimungkinkan dan reduksi tertutup dapat dipertimbangkan.

**Kata kunci — dislokasi tertutup, Dimple Sign, tidak dapat direduksi, MCL rupture, dislokasi lutut posterolateral**

## I. INTRODUCTION

Knee dislocation is a very rare case, with the incidence rate of less than 0.2% of all orthopedic injuries.<sup>1-3</sup> Posterolateral dislocation of the knee is also an uncommon injury with the incidence of irreducible knee dislocation is even less frequently encountered.<sup>4-5</sup> Posterolateral dislocation of the knee is already an uncommon injury, however its complication of irreducible knee dislocation is even rarer. Generally, it is caused by a high-energy trauma inducing rotational stress with a posterior and lateral displacement of the tibia.<sup>6</sup>

It is still debatable whether closed reduction should be attempted or direct open reduction should be the only management, however both surgical and non-surgical treatment are proven to be effective.<sup>1, 5-6</sup> The most common comorbid injury to the knee is the medial knee stabilizer, including the medial collateral ligament (MCL). Lack of reported outcomes regarding variable MCL repair procedure after posterolateral dislocation of the knee resulted in inability to select the most favorable procedure.<sup>7</sup>

We present a case of posterolateral knee dislocation treated using closed reduction, with MCL rupture resulting from high-energy and twisting injury treated with tendon repair with a good clinical result.

## II. CASE REPORT

A 50 years old male presented to the emergency room (ER) complained of deformity and pain of the left knee. He felt the pain after being involved in a road traffic accident (RTA) where there was a motorbike crash. The patient could tell his left knee was

out of place and felt rotated, the pain was sudden and brief after the RTA but the pain improved after being taken to the ER and felt only if the patient tried to move his left knee. The patient claimed that during the RTA, his leg was stuck to the other motor bike and was pulled out. Patient felt that his left knee was twisted while being pulled.

There was no history of comorbidities or any medical conditions involving his left knee before the RTA happened. He was slightly overweight (Body Mass Index 25.7, 70 kg/165 cm) with Indonesia BMI standard. The patient was working as an office employee, there was no history of smoking nor alcohol consumption. Apart from the complaint in his left knee, the general physical examination was within normal value.

Physical examination revealed a lateral shift of the patella of the left knee and a visible dimple sign. Slight pain was felt when touched at the site of injury, but was stable under pressure. Figure 1 showed the patient presentation in the ER. Patient left knee movements were limited due to pain. There was no limited movement of the left ankle and left foot. No vascular injury was detected.



**FIGURE 1. PATIENT'S PRESENTATION IN THE EMERGENCY ROOM. POSITIVE DIMPLE SIGN CAN BE OBSERVED AT THE MEDIAL SIDE OF THE KNEE.**

Radiographic evaluation confirmed lateral dislocation of the patella and posterolateral subluxation of the knee as shown in the figure 2.



**FIGURE 2. RADIOGRAPHIC EXAMINATION FROM ANTERIOR-POSTERIOR (AP) VIEW AND LATERAL VIEW. EXAMINATION CONFIRMED A LATERAL DISLOCATION OF THE PATELLA AND POSTEROLATERAL SUBLUXATION OF THE KNEE.**

The working diagnosis based on history, physical examination, and radio imaging examination was posterolateral dislocation of the left knee. Closed reposition and open reduction for evaluation were planned and attempted under general anesthesia. The knee was flexed to 120 degrees and internally rotated. Valgus stress was examined and positive valgus stress test was obtained during the closed reposition which concluded there is Medial Collateral Ligament (MCL) injury. The dislocated knee then was reduced and the dimple sign disappeared as shown in figure 3. Open reduction done through the midline incision with a medial parapatellar arthrotomy to fix the MCL injury. Medial collateral ligament (MCL) rupture was founded during the open evaluation and was repaired with Krackow technique. The surgical procedure shown in figure 4.



**FIGURE 3. DIMPLE SIGN DISAPPEARED AFTER CLOSED REDUCTION OF THE KNEE.**



**FIGURE 4. MEDIAL COLLATERAL LIGAMENT (MCL) REPAIR USING KRACKOW TECHNIQUE.**

Postoperative intervention is shown in figure 5. There were no specific post-op interventions. The knee is protected and was non weight-bearing for 6 weeks and immobilized for 2 weeks at 25 degrees of flexion. Physical rehabilitation started at 8 weeks post operatively. Currently patient at almost a year post-operatively, the patient was relieved from pain, currently in knee brace and encouraged to do partial weight bearing.



(a)



(b)



(c)

**FIGURE 5. A. POSTOPERATIVE RESULT AFTER REDUCTION OF DISLOCATION AND MCL REPAIR. B. KNEE IS PROTECTED IN A HINGED KNEE BRACE C. RADIOGRAPHIC EXAMINATION SHOWN COMPLETE REDUCTION.**

### III. DISCUSSION

Incidence of irreducible knee dislocation is extremely rare and majority of them are posterolateral or lateral dislocation.<sup>2,4</sup> Reduction may be possibly prevented by soft tissue that changes position and trapped in the intercondylar notch, possibly involving the medial tissue of the knee and commonly associated with ligament injuries such as collateral ligaments or meniscus injury.<sup>3</sup>

Mechanism of injury of posterolateral knee dislocation may be caused by both high energy and low energy trauma. Although the nature of the accident (high or low velocity) and the severity of dislocation (complete or incomplete) are not predictive of the severity or the chance of irreducibility.<sup>6</sup> The force is possible to cause extreme valgus and rotational force during knee flexion to both tibia and femur in opposing directions, with the assumption of rotational force direction could be internal rotation or external rotation that put pressure of medial femoral condyle (MFC) through the anteromedial capsule and retinaculum. It causes mal-aligned femur and tibia and also joint space enlargement.<sup>1,4</sup>

The force may cause extreme valgus along with rotational force to both the tibia and femur of opposing directions when flexing the knee. The assumption of rotational force could be internal and external rotation causing pressure to the medial femoral condyle (MFC) through the anteromedial capsule and retinaculum. Thus resulting in a

malalignment and joint space enlargement of femur and tibia.

Diagnosis of irreducible knee dislocation is visible during inspection, early orthopedic surgeon input may be required because the diagnosis is often difficult and further treatment needs to be carefully planned.<sup>4</sup> Depression over the medial joint line, the 'dimple sign' is what could be visualized. The classical "dimple sign" or "pucker sign" or "sulcus sign" on physical examination is presented as a specific feature resulting from injured medial structure and the tethering of the trapped capsule that is invaginated into joint space, together with the prominence of the medial femoral condyle. Failure to recognize this sign will lead to repeated attempts of close manual reduction, this could lead to more secondary soft tissues injuries. Obese patients may not have this with the presence of swollen knees.<sup>2,3</sup> Dimple sign is also a predictive for ischemic necrosis of the skin, where the skin and subcutaneous tissue is trapped and great traction inhibits the perfusion by blood vessels.<sup>2</sup> This sign may be accentuated by knee flexion.<sup>5</sup> Using the Schenck anatomic knee dislocation classification system, the most common type of knee dislocation is a bicruciate injury with involvement of one collateral ligament, or called KD-III, (80.5%), in this case involved medial collateral ligament (MCL) which is called KD-III M based on Schenck.<sup>10</sup>

In an irreducible knee dislocation, the examination should robustly proceed to the assessment of neurological and vascular status of the distal limb. Close attention given to soft tissues for any expanding hematoma, active bleeding, and distal ischemia. Measurement of ankle-brachial

index as normal palpation of dorsalis pedis and posterior tibial artery pulses does not always exclude vascular injury, although an ABPI (Ankle-brachial Pressure Index) of > 0.9 was proven to be 100% accurate in excluding vascular injury. However, vascular injury is less common in PL knee dislocations. Capillary refill time and color of distal limb should also be documented in a timely manner. Neurological examination involves assessment of motor and sensory functions of common peroneal nerve and tibial nerve. An assessment of the leg compartments should be made and monitored.<sup>4</sup>

A plain radiograph is always quick and easy to obtain to establish the nature of injury and to rule out any associated fractures. An Antero-Posterior (AP) radiograph of the knee will likely demonstrate an AP of the proximal tibia and an oblique of the distal femur. In PL knee dislocation, widening of medial joint space as well as radiological "dimple sign" should be seen on a plain radiograph. The patella maintains its in-line attachments to the tibial tuberosity (patellar tendon and quadriceps tendon) and will appear reduced with respect to the proximal tibia, but dislocated with respect to the distal femur.<sup>4,6</sup> Magnetic resonance imaging may be helpful in diagnosing other soft tissue injuries such as combined ligament injuries but sometimes may cause delayed treatment, which is not suggested. Combined ligament injuries should be carefully assessed by magnetic resonance imaging (MRI) or physical examination after reduction.<sup>1,3</sup>

Complete reduction of the dislocation should be the first aim of treatment. There is still no definite consensus as to the best method and treatment options range from closed

reduction, arthroscopic debridement of the capsule-ligament structures to open reduction and removal of the muscle interposition.<sup>6</sup> Older studies and older general consensus were split on consideration of closed reduction being attempted first or it should be an immediate acute open reduction to lower risk of complications and functional deficits.<sup>8,9</sup>

Surgical reduction should be performed emergently to reduce the risk of skin necrosis at the point of maximal invagination and tethering. The surgical technique for open reduction is not difficult. The surgical approach is extensile and direct, and targeted at achieving maximal exposure of torn structures and the buttonholed medial femoral condyle. Following division or reduction of the interposed tissue, reduction is achieved almost instantaneously by translating the femur laterally with minimal effort. These soft tissues can include medial capsule, retinaculum, MCL, MPFL, vastus medialis and medial meniscus. Some authors attempt arthroscopic- or arthroscopic assisted reduction prior to open reduction, both in an attempt to spare the patient a disfiguring incision, and to allow for closer intra-articular inspection.<sup>5</sup>

Postoperatively, the knee is protected in a hinged knee brace during mobilization. Besides torn medial structures and cruciate ligaments, some authors have found avulsion of lateral structures including the lateral collateral ligament from its femoral attachment. Protected weight-bearing will allow for healing of torn, repaired and approximated structures. Long term follow-up is necessary to detect the onset of post-traumatic arthritis.<sup>5</sup>

#### **IV. LIMITATIONS**

Due to the limitation of our healthcare facilitations, x-ray was the only available radiographic evaluation to use in this case. Arthroscopic procedure also suggested to be done in this patient, but due to our tools limitation we are unable to perform this procedure. The follow up duration also relatively short where it is only 1 year post-operative.

#### **V. CONCLUSION**

posterolateral dislocations of the knee are uncommon and early recognition is key. Dimple sign is important to prevent repeated attempts of close manual reduction, this could lead to more secondary soft tissues injuries. Complete reduction of the dislocation should be the first aim of treatment and when treated properly this condition has a good prognosis.

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