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CASE REPORT

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Common peroneal nerve rupture with multiple ligament knee injury: A case report

Kaoru Tada | **Masashi Matsuta** | **Mika Akahane** | **Atsuro Murai** | **Hiroyuki Tsuchiya**

Department of Orthopaedic Surgery, Graduate School of Medical Science, Kanazawa University, Kanazawa, Japan

Correspondence
Kaoru Tada, Department of Orthopaedic Surgery, Graduate School of Medical Science, Kanazawa University, 13-1 Takaramachi, 920-8641 Kanazawa, Japan.
Email: tdkr@med.kanazawa-u.ac.jp

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Abstract

In peroneal nerve palsy with closed knee injury, most of the case improves by follow-up. We present a case of peroneal nerve rupture with closed multiple ligament knee injury, requiring nerve transplantation. In multiple ligament knee injury, it is necessary to consider the possibility of peroneal nerve rupture.

KEYWORDS

multiple ligament knee injury, nerve injury, peroneal nerve, posterolateral corner injury

1 | INTRODUCTION

The posterolateral corner of the knee consists of the lateral collateral ligament (LCL), popliteus tendon complex, popliteofibular ligament, and posterolateral capsule.[1] It plays a major role in the resistance of external rotation and varus stress of the lateral side of the tibia on the femur.[2–4] As dislocation of the knee joint is observed due to the failure of the posterolateral corner (PLC), it is necessary to suspect combined soft tissue damage in the surrounding area.

In severe acute multiple ligament knee injuries, there are not a few cases in which the common peroneal nerve is injured but many of them recover in the natural course; however, it has been reported that prognosis of peroneal nerve palsy after knee dislocation is generally poor.[5,6] However, there are not many reports of complete rupture of the peroneal nerve in closed multiple ligament knee injuries; these patients, sometimes, get follow-up examination despite complete nerve rupture. We present a case of common peroneal nerve rupture with closed multiple ligament knee injury, requiring a surgery.

2 | CASE PRESENTATION

A 34-year-old woman with severe obesity (body mass index: 42.1) stumbled on a curb while walking on the road, and fell down, twisting her left knee. She felt strong pain and had difficulty with dorsiflexion of her foot, so she visited an emergency outpatient clinic of that day. She had no past medical history.

During her first visit to the doctor, left knee pain, sensory disturbance of the lower leg and dorsum of foot, and inability to dorsiflex the ankle were observed. In the physical findings, there was no apparent dislocation of the left knee joint, but there was gross instability of the lateral

side. Radiographs taken at the hospital were negative for acute fracture and showed that normal alignment of the knee was maintained. On magnetic resonance imaging (MRI), rupture of the left anterior cruciate ligament (ACL), left lateral collateral ligament, left biceps femoris tendon, and left popliteus muscle tendon were suspected. (Figure 1) Although there was a sensory disturbance from the left lower leg to the dorsum of the foot and difficulty in dorsiflexion of the left ankle joint, MRI could not confirm apparent peroneal nerve rupture. Because it was a closed multiple ligament knee injury, the doctors diagnosed the nerve injury as neurapraxia of the peroneal nerve. One week after injury, they performed a repair of the left lateral collateral ligament, left biceps femoris tendon, and left popliteus muscle tendon; the left ACL would be repaired in a second phase. Despite intraoperative confirmation of complete rupture of the common peroneal nerve, the doctor could not repair it microscopically. They sutured the distal attachment of the left lateral collateral ligament and left biceps femoris tendon, and referred the patient to our department.

At the time of referral to our department, sensory disturbance in the common peroneal nerve region and complete palsy of the anterior tibialis muscle and extensor digitorum longus muscles were observed. Surgical treatment for common peroneal nerve rupture was performed 4 days after visiting our department, which was on the twenty-sixth day after injury. Intraoperative findings revealed a complete rupture of the common peroneal nerve at the bifurcation of the common peroneal nerve and lateral sural cutaneous nerve in the deep layer of the biceps femoris sewn to the fibula head. (Figure 2) The stump of the peroneal nerve had turned dark purple, and the degenerated area was removed. After removal, approximately 70 mm of nerve defect occurred, and autologous nerve transplantation using a cable graft of the ipsilateral sural nerve was performed. (Figure 2) During the period until recovery, she was instructed to perform passive dorsiflexion exercises of the ankle joint to prevent contracture of the joint. She was also encouraged to wear a short leg orthosis when going out.

At our last follow-up, 3 years postoperatively, the patient's sensory disturbance in the peroneal nerve region was improved to the extent that she felt almost no symptoms. The manual muscle test of the anterior tibial muscle, the extensor hallucis longus muscle, and extensor digitorum longus muscle were recovering to 2, 3, and 4, respectively. She visits another doctor for rehabilitation and walks with a brace.

3 | DISCUSSION

Generally, knee dislocations resulting in multiple ligament knee injuries are associated with high-energy mechanisms; however, Werner BC et al. reported obese patients are at risk of multiple ligament knee injuries from simple falls.[7] The clinical features of our case represent "ultra-low velocity knee dislocation" which has been shown to be associated with high neurovascular complication rate. The discrepancy between the low-energy injury mechanism and injury severity poses a difficulty in initial diagnosis.

The bone of the knee contributes little to the stability of the joint; both the static and the dynamic stability of the knee depend on its supporting soft tissues.[8] The primary resistance against hyperextension injury of the knee joint is the posterior cruciate ligament, while the

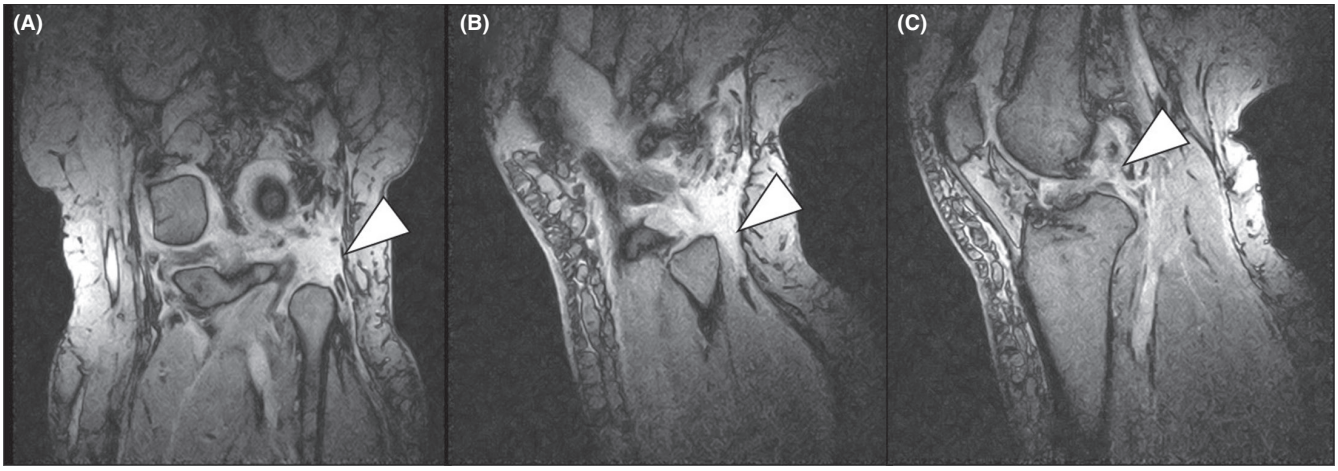

FIGURE 1 (A) Coronal slice of the knee joint at the level of fibular head. (B) Sagittal slice of the knee joint at the level of fibular head. Rupture of the lateral collateral ligament, biceps femoris tendon, and popliteus muscle tendon were suspected. (C) ACL slice of the knee joint. Rupture of the ACL was suspected

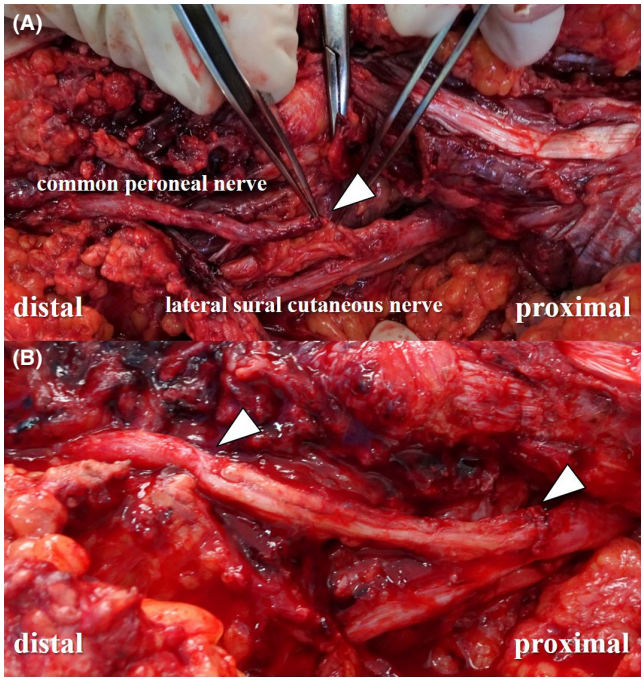

FIGURE 2 (A) Triangle points to rupture of common peroneal nerve. (B) Two triangles point to where the nerve was sutured

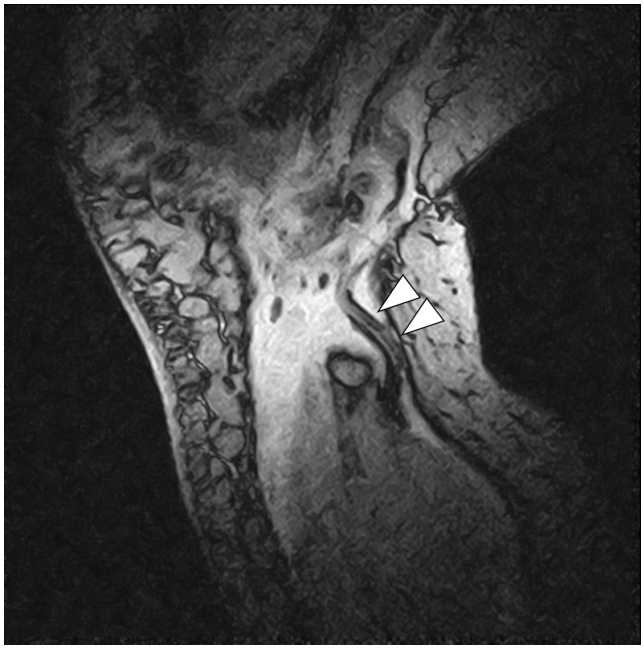

FIGURE 3 Sagittal slice of the knee joint. Two triangles point sagged common peroneal nerve (Lariat sign)

secondary resistance is the anterior cruciate ligament and posterior joint capsule. With hyperextension of the knee joint, injury of the posterior cruciate ligament, anterior cruciate ligament, and posterior joint capsule occurs. When varus is added to the knee joint in addition to hyperextension, instability of the posterolateral corner occurs.[9] Although between 5 and 20 percent of patients with dislocation of the knee joint had injury of the common peroneal nerve, most of them were neurapraxia which could be recovered.[10–15] It has been reported that common peroneal nerve injury is relatively common in patients with dislocation of the knee with posterolateral corner injury, and like this case, the nerve palsy is particularly likely to occur in cases complicated with biceps tendon attachment injury.[16] Therefore, the nerve has to be identified, dissected, and protected in patients with dislocation of the knee with posterolateral corner injury.[17] The mean position of the common peroneal nerve with respect to the tip of the fibular head was at 53.1 mm on the biceps femoris and 20.7 mm on the fibular neck.[18]

In the report of 31 cases of closed multiple ligament knee injuries with dislocation of the knee joint, only one case did not tend to recover.[19] In closed injury, it is considered that complete rupture of the common peroneal nerve is unlikely to occur. In this case, it is assumed that when the patient was falling, hyperextension and varus of her knee occurred, leading to posterolateral corner injury and biceps tendon injury, as well as common peroneal nerve rupture. Although cases of common peroneal nerve rupture in addition to multiple ligament knee injury due to sports and fall injury have been reported,[20] there have been no reports of cases of the ruptures due to simple falls. In this case, we consider that severe obesity resulted in high-energy trauma and nerve rupture occurred due to a simple fall.

In diagnostic imaging of peroneal nerve rupture, MRI findings are the most important. The ruptured common peroneal nerve appears to bend on MRI and is called "Lariat sign."[21] Looking back at this case, it was not as clear as the previous report, but MRI showed a deflection of "Lariat sign." (Figure 3) Although this sign is not necessarily accepted as confirmation, it is necessary to recognize that the sign is important clue when we diagnose a common peroneal nerve rupture.

Neurorrhaphy is the first choice for treatment of acute common peroneal nerve rupture; however, autologous nerve transplantation is indicated for large defects. It has been reported that primary sutures are often difficult with common peroneal nerve rupture after dislocation of the knee joint, and the 70 mm defect which occurred in our case required autologous nerve transplantation.[22] Neurorrhaphy and autologous nerve transplantation for nerve ruptures should be performed as soon as possible. If neurorrhaphy or nerve transplantation does not result in adequate recovery, a tendon transfer to the tibialis

anterior muscle should be considered after the first postoperative year.

In conclusion, even if due to low-energy trauma, it is necessary to consider the possibility of peroneal nerve rupture in patients with multiple ligament knee injury.

AUTHOR CONTRIBUTION

Kaoru Tada: writing - review and editing. Masashi Matsuta: writing - original draft. Mika Akahane: assistant to surgery. Atsuro Murai: assistant to surgery. Hiroyuki Tsuchiya: supervision.

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CONFLICTS OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

DATA AVAILABILITY STATEMENT

The data used to support the findings of this study are available from the corresponding author upon request.

ETHICAL APPROVAL

This study was conducted in accordance with the Standards of the Committee on Human Experimentation of the institution and was approved by the review board (approval No. 2015–022 [1786]).

CONSENT

Written informed consent for this report was obtained from the patient.

ORCID

Kaoru Tada https://orcid.org/0000-0001-8930-1093
Masashi Matsuta https://orcid.org/0000-0001-7545-9711

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