

## Original Article

# One-stage anatomic double bundle anterior and posterior cruciate ligament reconstruction

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**Abstract:** Introduction: Main evidence of the heavy knee dislocations is the rupture of both Anterior Cruciate Ligament (ACL) and Posterior Cruciate Ligament (PCL). There are limited sources for the treatment of both ligaments at a single stage. Materials-method: One-staged anatomic double-bundle ACL and PCL reconstruction technique has been applied to 2 cases aged 20 and 36 with traumatic knee dislocation. Lateral collateral ligament and posteriolateral corner reconstruction added to one case, and medial collateral ligament and posteromedial corner reconstruction for the other case. Because of additional femur fractures of the both cases, ligament reconstructions have been applied after the main treatment. Anterior tibialis tendon (ATT) allograft has been used for graft for both cases because of other stabilization deficiencies of knees. It has been confirmed that femoral and tibial tunnels constructed with anatomic double-bundle technique are fitting to anatomic locations by the post-operation CT results. Post fixation screw has been used for tibia, and endobutton at femur. Results: Tracking records of patients at 8th month shows that; Lysholm score of the case aged 20 was 89, and 85 for the case aged 36. While KT-1000 values was 3.7 mm, and 4.1 mm for 15 N power; and 9.1 mm-9.6 mm with the maximum power. Conclusion: Surgical technical details of one-staged double-bundle reconstruction for ACL and PCL injuries which is gaining popularity recently has been stated.

**Keywords:** Anterior cruciate ligament, anterior tibialis tendon allograft, double bundle, posterior cruciate ligament

## Introduction

Multiple ligament injuries are well known complications of traumatic knee dislocations. Combined anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) injuries managed with different surgical methods [1]. However, mild residual laxity is common; and satisfactory range of the knee motion cannot always be achieved after surgery [2]. One stage ACL and PCL reconstruction, using single-bundle technique, have been reported recently with successful results [3]. On the other hand, biomedical studies have shown that anatomic double-bundle reconstruction of each cruciate ligament has better stability to ACL or PCL deficient knee rather than single-bundle reconstruction [4]. There are limited sources for the anatomic treatment of both ligaments at a single stage [2]. The clinical and radiological follow up of two patients underwent single stage anatomic double-bundle reconstruction of ACL and PCL using anterior tibialis tendon as allograft.

## Material method

During January, 2010 to March, 2011, two patients with combine ACL and PCL injuries underwent single stage anatomic double-bundle reconstruction of ACL and PCL using anterior tibialis tendon as allograft retrospectively reviewed in this study. Average age and follow-up were 28 years (range, 20-36 years) and 10 months (range, 8-12 months), respectively.

## Surgical technique

Anatomic double-bundle anterior and posterior cruciate ligament reconstruction mentioned in previously published reports [2, 3, 5, 6]. In surgical technique extreme caution was required in creating bone tunnels, especially tibial tunnels at PCL reconstruction, to leave enough bone between the tunnels. While drilling the posterior medial bundle (PMB) bone tunnel guide wire should be placed as distally as possible on the anteromedial tibia. During this pro-

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**Figure 1.** Case of 20 years-old male postoperative x-ray (A, B), and postoperative 3D computed tomography (C, D).

cedure fluoroscopic guiding is useful. All reconstructions were performed by senior author (MSB).

### Results

#### Case 1

20 years old male patient admitted to hospital because of motorcycle accident. He was diagnosed as Type 3A open fracture of left intra-articular distal femur, right knee dislocation (Schenck type 3) and right knee ACL, PCL, LCL rupture. After the treatment of left femur frac-

tures (after 6 month), one stage anatomic double-bundle ACL, PCL and LCL reconstructions are performed by using tibialis anterior tendon allograft at the same session because of the inadequacy at the other stabilizer structures of the knee (**Figure 1**). He was placed in a knee brace in full extension without weight bearing. Passive range of motion exercises (0°-90°) and isometric contractions of hamstrings and quadriceps are initiated immediately after the operation. At the 3rd week, patients are mobilized with partial weight bearing (as tolerated to half of the body weight) with a brace locked in full



**Figure 2.** Case of 36 years-old male postoperative x-ray (A), and intraoperative photographs showing the both femoral and tibial tunnel (B).

extension. At the 5th to 8th weeks, patients mobilized full weight bearing and full range of knee motion is encouraged ( $0^{\circ}$ - $140^{\circ}$ ). At 8 months follow up he achieved full range of motion, Lysholm score of 89 and KT-1000 value of 3.7 mm (15 N) and 9.1 mm (man max).

### Case 2

36 years old male patient admitted to hospital because of car accident. Left femur medial epicondyle fracture, and left knee dislocation (Schenck type 5) and MCL, PCL, ACL rupture. Primarily the medial epicondyle fracture fixation is done and after radiologically union (after 2 months) is seen a second operation for ligament reconstruction is planned. One stage anatomic double-bundle ACL, PCL and MCL reconstructions are performed at the same session by using tibialis anterior tendon allograft because of the inadequacy at the other stabilizer structures of the knee. (Figure 2) Postoperative rehabilitation protocol was the same with case 1. At 12 months follow up he achieved full range of motion, Lysholm score of 85 and KT-1000 value of 4.1 mm (15 N) 9.1 mm (man max).

### Conclusion

Combined injuries of ACL and PCL are rare injuries causing significant functional disabilities. These patients usually victims of motor vehicle accidents and have additional skeletal or internal organ injuries. Both of our patients have surgically treated femur fractures before ligament reconstruction. One-stage reconstruction for ACL and PCL offers diminished surgical trauma to the patients who has already underwent other surgical procedures. Double bundle reconstruction of ACL and PCL provides a more anatomic restoration of knee ligaments. In surgical technique extreme caution was required in creating bone tunnels, especially tibial tunnels at PCL reconstruction, to leave enough bone between the tunnels. While drilling the posterior medial bundle (PMB) bone tunnel guide wire should be placed as distally as possible on the anteromedial tibia. During this procedure fluoroscopic guiding is useful [5]. We believe that single stage anatomic reconstruction of both ACL-PCL injuries can be performed safely and successfully with meticulous technique.

### Disclosure of conflict of interest

None.

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