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Outcomes of surgical stabilization in patients with combined ACL deficiency and patellofemoral instability — A case series

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ABSTRACT

Background: The purpose of this study was to assess the disease-specific quality of life, and the objective clinical and functional outcomes of patients with symptomatic ACL deficiency and patellofemoral instability following surgical stabilization of both ligaments.
Methods: Between February 2010 and August 2013, 22 subjects underwent a combined ACL reconstruction and patellofemoral stabilization. The anterior cruciate ligament quality of life questionnaire (ACL-QOL) was completed pre-operatively and two-years post-operatively. Clinical and functional assessments were performed two-years post-operatively. A paired *t*-test assessed the difference between the pre- and post-operative ACL-QOL scores. Effect size was calculated manually using the Eta squared formula. A Pearson r correlation coefficient assessed for a relationship between the post-operative ACL-QOL scores and functional tests.
Results: Twenty patients completed the 24-month ACL-QOL, 17/20 completed clinical assessment, and 14/20 completed functional testing. The mean pre-operative ACL-QOL score was 21.20 (SD = 7.25, range 5.8 to 31.7) and two-years post-operative it was 65.24 (SD = 21.38, range 34.5 to 99.1). The paired *t*-test demonstrated a statistically significant improvement in ACL-QOL scores; $t(19) = 9.119$, $p < .001$ (two-tailed). The Eta squared statistic (0.81) indicated a very large effect size. Statistically significant correlations ($p < .05$) were evident between post-operative ACL-QOL scores and all the operative limb single-leg hop tests.
Conclusions: Combined ACL reconstruction and patellofemoral stabilization surgery leads to good results. This patient cohort with chronic ACL–MPFL injuries demonstrated a statistically significant change in disease-specific quality of life following surgery. In addition, the patient-reported outcomes and objective functional testing results correlated.
Level of evidence: Case series — IV.

1. Introduction

The aim of an anterior cruciate ligament (ACL) reconstruction is to regain functional stability of the knee following ACL injury, ideally allowing patients to return to their pre-injury level of sport and activity. ACL injuries do not always occur in isolation and other structures and ligaments in the knee are commonly injured. Combined knee ligament injuries have been reported to result

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in significant morbidity and functional impairment involving ongoing episodes of instability, pain and an inability to return to pre-injury participation in sport and recreational activities [1–3]. For combined anterior cruciate–medial collateral ligament (ACL–MCL) and anterior cruciate–posterior cruciate ligament (ACL–PCL) injuries, improved outcomes have been reported in both acute and chronic instability when both ligaments are addressed at the time of surgery [4–7].

The incidence and treatment algorithm for combined ACL injury and patellofemoral instability remains unclear. Both ACL tears and patellofemoral dislocations occur with a similar mechanism of injury, usually a valgus, external rotation and deceleration force [8]. The initial injury is frequently followed by recurrent episodes of knee instability. Sillanpaa et al. presented the incidence of simultaneous occurrence of ACL injury and patellar dislocation during a sporting injury in a young athletic population [9]. These authors concluded that a patellar dislocation was associated with seven percent of all complete ACL ruptures and 13% of partial ACL tears. In this series of six concomitant ACL/MPFL injuries, two of the six subjects (33%) required a second surgery following an ACL reconstruction to stabilize the patella due to ongoing symptoms of instability [9]. To our knowledge there are no published outcomes of combined surgical procedures in patients presenting with symptomatic ACL deficiency and patellofemoral instability.

The purpose of this study was to assess the disease-specific quality of life, and the objective clinical and functional outcomes of patients with symptomatic ACL deficiency and patellofemoral instability following surgical stabilization of both ligaments.

2. Materials and methods

A retrospective review of data collected on patients with the dual diagnosis of patellofemoral instability and ACL deficiency that underwent surgical stabilization of both ligaments was completed. Diagnosis of ACL insufficiency and patellofemoral instability was confirmed by one of three fellowship trained orthopaedic surgeons (MH, GB, LAH) based on history and physical examination. Surgical intervention for the ACL deficiency was recommended for all patients with symptomatic tibiofemoral instability who had failed non-operative management. For patellofemoral instability, patients who reported pre-existing episodes of dislocation of the patella, or complained of instability out of proportion to a typical ACL tear and had evidence of significant increase in lateral laxity of the patella combined with apprehension, were considered for patellofemoral stabilization. Between February 2010 and May 2013, 22 subjects underwent a combined ACL reconstruction and patellofemoral stabilization procedure. In all patients, a positive Lachman and pivot shift test, as well as a dislocatable patella was confirmed by examination under anaesthesia. There were five males and 17 females; the average age was 27.9 (SD 8.21; range 15 to 43). The average body mass index (BMI) was 25.14 (SD 4.06; range 20.5 to 38). All patients were skeletally mature.

All ACL reconstruction procedures were performed using an anatomic single bundle technique with suspensory femoral fixation (XO Button, Conmed Linvatec, Largo, FL, USA or Endobutton Smith and Nephew, Andover, MA, USA) and interference screw fixation on the tibia (Genysis Matryx interference screw Conmed Linvatec, Largo, FL). MPFL reconstruction procedures were performed with an anatomic double bundle technique with the graft attached to the superior half of the superomedial border of the patella. The graft was passed to the femoral insertion point through layer two of the knee, below the vastus medialis fascia in an extra-articular position. Anatomic femoral placement was confirmed by assessment of graft biomechanics. The graft was then docked into an appropriate sized tunnel at the femoral attachment and fixed using a biocomposite screw (Genesys Matrix, Conmed Linvatec, Largo USA or BioSure, Smith and Nephew, Andover, USA). The MPFL imbrication was performed using an open pants-over-vest technique. Through a two centimeter incision, the MPFL was incised approximately one to two centimeters medial to the patellar border, leaving the knee joint capsule intact. Two imbrication sutures (#1 Vicryl) were placed to shorten the MPFL, adjusting for the degree of laxity and tissue quality of the particular patient.

Post-operative rehabilitation included early weight bearing as tolerated and a short period of immobilization (one to two days) followed by unrestricted range of motion of the knee. The phase-based rehabilitation protocol emphasized quadriceps activation, including the use of electrical muscle stimulation and functional exercises. Plyometrics were initiated at three to four months, with gradual return to pivoting activities starting at six months after successful completion of functional testing. Return to sport was not recommended until a minimum of 12-months post-operative.

All patients completed the ACL-QOL, a patient-reported quality of life questionnaire, pre-operatively and at the two-year post-operative visit. The ACL-QOL has demonstrated validity, reliability and responsiveness in both pre- and post-operative ACL patients [10,11]. A battery of clinical and functional tests was performed at 24 months post-operatively. The tests included clinical laxity assessment of the knee ligaments, range of motion (ROM), Beighton score [12,13], single-leg balance, and four single-leg hop tests. The hop tests involved a comparative assessment of limb-to-limb function for a single hop for distance, a six meter timed hop, a triple hop for distance, and a triple cross-over hop. These tests have previously been assessed as valid and reliable for post-operative ACL reconstruction functional testing [14–16].

2.1. Statistical considerations

Descriptive and demographic data were collected for all patients. A paired *t*-test was employed to determine the difference between the pre-operative and two-year post-operative ACL-QOL scores as a measure of 'patient improvement.' Effect size was calculated manually using the Eta squared formula: $t^2 / t^2 + N - 1$. A Pearson r correlation coefficient was employed to determine the relationship between the ACL-QOL scores and a battery of functional tests. Data were analyzed using SPSS© version 22.