Analysis of Curative Effect of Artificial Ligament Reconstruction Under Knee Arthroscopy in the Treatment of Posterior Cruciate Ligament Injury

Sir,

Posterior cruciate ligament (PCL) injury directly affects knee-joint functions, thereby leading to abnormal rotation of knee joints, and backward, straight and lateral instability, with an important impact on the patients' quality of life. Knee arthroscopy, a minimally invasive surgical method offers several advantages, such as limited surgical trauma and changes in the intra-articular environment, and decreased incidence of joint infections. Currently, the effect of knee arthroscopy in anterior cruciate ligament (ACL) reconstruction has been confirmed.[1] However, both basic and clinical studies on PCL lag behind ACL due to the lack of knowledge of the biomechanical function and compound ligament injury of PCL. Thus the treatment strategy may be improperly targeted to treat one of these two factors.[2] In recent years, knee arthroscopy in PCL injury reconstruction treatment has been applied with satisfying results.

A total of 40 patients with PCL laceration, who were treated at the Linyi Central Hospital between January 2014 and August 2018, were enrolled in the present study, which was approved by the Ethics Committee of the Linyi Central Hospital. The inclusion criteria were patients aged >18years; isolated completely or partial PCL injuries diagnosed by MRI; with positive result in the posterior drawer test; positive result in the Lachman test; and had received artificial ligament reconstruction treatment under knee arthroscopy. The exclusion criteria were patients with complex injuries; with heart, liver, kidney and lung dysfunctions; with severe mental disorders; received knee joint operation treatment at the affected side; unwilling to receive surgical treatment; and with autoimmune and coagulation disorders.

All 40 patients received artificial ligament reconstruction treatment under knee arthroscopy. Continuous epidural anesthesia was maintained for arthroscopy in order to determine PCL injury site. Artificial ligament was used for PCL reconstruction. Briefly, the artificial ligament was inserted into a special tibia locator tip using anteromedial arthroscopy and placed at 1.5 cm (PCL tibia stop blot) to the posterior tibial plateau through the femoral condyles. Following positioning, a guide pin was drilled on the inside of the tibial tuberosity in order to create a 7.5 mm bone tunnel. Subsequently, the guiding steel wire was penetrated. The locator was pulled out from the joint using the anteromedial arthroscopic approach and stored for standby application. A femoral tunnel was established and the locator was inserted 1.5 cm into the medial wall of the femoral intercondylar sulcus *via* the anterolateral approach. Subsequently, a Kirschner wire was inserted through the thigh bone 1cm from the posterior side of the articular surface for positioning. The tunnel was drilled at angles of 45° and 30° in the vertical and coronal plane of the thigh bone, respectively, using a guiding needle. A forstner bit was used in order to drill a 6-mm anterolateral thigh bone channel to be from the outside to the inside of the joint and then a Kirschner wire was placed at 1cm into the bone channel. Subsequently, the bone channel was drilled at the angles of 55° and 20° in the vertical and coronal plane of the thigh bone, respectively, using a guiding needle. Following the bone channel drill, Y-shaped artificial ligament was placed. The tibia was fixed using titanium screws. Tunnelled from tibia, strong sutures were passed through and the graft was stabilised in femur without screws or anchor sutures. Following firm fixation, a posterior drawer test was conducted. When the test was negative after the graft insertion, the residual ligament was cut off and the articular cavity was washed out. Subsequently, the incision was sutured layer by layer. Following surgery, when the joint cavity should be retained for drainage, a drainage tube was inserted from the anterolateral arthroscopic canal and a disposable drainage bag was connected externally. The drainage tube was kept unobstructed before it was pulled out 24 hours following operation. Finally, rehabilitation training and physical exercise began in the early postoperative period and 3 months after surgery, respectively.

All patients were followed up for an average of 12 months after surgery. The visual analogue scale (VAS), Lysholm knee score (LKS), and international knee documentation committee (IKDC) function score were used to evaluate patients' function recovery prior to and at 12 months following surgery. Postoperative complications were observed in all patients. All statistical analyses were performed using the SPSS 25.0 software. Paired-samples t-test was applied and a $p<0.05$ was considered to indicate a significant difference.

In the present study, 40 patients were included, having 27 males (67.5%) and 13 females (32.5%), with ages between 20 and 38 years (average, 0.64±2.72 years). Regarding affected side, 25 (62.5%) and 15 (37.5%) individuals had their left and right knee injured, respectively. The causes of injury were athletics in 14 individuals (35%), traffic-caused in 24 (60%) and pressure injuries by heavy objects in 2 (5%). The duration from trauma to surgery ranged from 2-15 weeks (average duration, 7.25±1.36 weeks). VAS of patients 12 months postoperatively (1.22±0.37) was significantly reduced compared with that noted preoperatively (6.32±1.29; $t=34.949$; $p<0.001$). By contrast, LKS of patients increased postoperatively (91.81±2.55) compared with preoperatively (61.42±3.35; $t=-240.161$; $p<0.001$). Finally, IKDC score of patients 12 months postoperatively (94.25±2.24) was also increased compared with that noted preoperatively (64.03±4.39; $t=-88.668$; $p<0.001$). In the early postoperative period, no infection, ligament loosening or rupture and motion limitation were observed in any of the patients. In addition, no obvious swelling was observed 6 months after surgery.

Current ligament reconstruction methods for PCL injury repair include autologous and allogeneic tendinous tissue, and artificial ligament reconstruction. The use of autologous grafts may lead to severe prepatellar pain, large surgical incision, longer operating time and increased risk of patella fracture and patellar tendon rupture.[3] Allogeneic tendinous tissues are more readily available; however, immunoreaction, looseness and infectious diseases may occur. Besides, the expense is high.[4] Compared with the reconstruction of ACL using Semitendinosus and Gracilis tendons, the reconstruction of artificial ligament may benefit patients with early functional exercise and small surgical trauma, without damaging the tendon structure. In addition, artificial ligament reconstruction supply sources are sufficient and the risk of allograft ligament-related infectious diseases and the use of defective autologous ligament materials is reduced The present study suggested that artificial ligament reconstruction under knee arthroscopy in PCL treatment exhibited high safety without any obvious complications. This observation is in agreement with the results of a previous study by Kato *et al.*[5] In this study, the author observed that, in the follow-up visit, the knee joint pain degree of patients postoperatively was reduced; whereas, LKS and IKDC scores were increased. These results indicated that patients' knee joint functions were obviously improved and affirmed the benefits of artificial ligament reconstruction application in the treatment of PCL injury.

In conclusion, artificial ligament reconstruction under knee arthroscopy exhibits a significant effect on the restoration of knee function in patients with PCL injury, thus it is worthy of clinical application.

CONFLICT OF INTEREST:

Authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:

KZ: Study concept, data collection, data analysis, investigation, writing, critical review and revision, and final approval of the article.

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Kai Zhang[1], Ruiqing Liu[1] and Yong Zhang[2]

[1]Department of Orthopedics, Linyi Central Hospital, Shandong Province, China

[2]Department of Dermatological Surgery, Dermatology Disease Prevention and Treatment Institute of Zaozhuang City, Shandong Province, China

Correspondence to: Yong Zhang, Department of Dermatological Surgery, Dematology Disease Prevention and Treatment Institute of Zaozhuang city, Shandong Province, China
E-mail: txb2p6@163.com

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