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Original Article

Combined anterolateral posterolateral rotary instability: Is posterolateral complex reconstruction necessary?

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Abstract

BACKGROUND: The treatment of combined anterolateral posterolateral rotary instability has been done by correcting knee alignment, anterior cruciate ligament (ACL) reconstruction plus repair or reconstruction of the posterolateral complex. Because of the technical difficulties encountered in these operations and the need for more than two stages, and considering the controversy among the role of posterolateral complex (PLC) in valgus knees, this study was designed to observe the results of treating this instability by ACL-reconstruction alone, after correction of varus, without reconstruction of the posterolateral complex or further extra-articular manipulation.

METHODS: This was a clinical trial performed on 29 patients (29 knees) with combined anterolateral posterolateral rotary instability. Subjective and objective instability signs were recorded. Arthroscopy was then performed and a valgus osteotomy was done to correct alignment. Then in a second stage, an ACL-reconstruction was carried out. Results, after a mean of 23 months follow-up, were compared to the conditions before surgery. Fisher exact test, X^2 and Wilcoxon tests were used to analyze the data. $P<0.05$ was considered to be meaningful.

RESULTS: Pain was relieved in more than half and locking was improved in all of the patients. Giving way of the knee was diminished from 79.3% to 6.9%. Special instability tests showed a significant improvement after surgery ($P<0.001$). Most of the patients returned to the preinjury level of work or sports.

CONCLUSIONS: Based on the results of this study, ACL-reconstruction alone, after correction of varus, can be sufficient to address this combined knee instability without farther procedures on extra-articular structures and posterolateral complex, thus avoiding unnecessary complications and longer rehabilitation.

KEY WORDS: Combined knee instability, anterior cruciate ligament reconstruction, posterolateral complex, valgus osteotomy.

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Sport injuries of the knee are among the most important causes of losing work and sport activity [1,2]. A generous comprehensive approach to these injuries seems necessary in order to improve the quality of life. Of these injuries, combined anterolateral posterolateral rotary instability (CAPRI) has received increasing attention because of the complexity and its difficult treatment and rehabilitation [1-3]. There has been controversy among every aspect of this instability including its treatment protocol [3-7]. However, what is agreed upon is the importance of treating this kind of instability especially in young active individuals because in case of no treatment, there will be a progressive destruction of menisci and articular cartilage secondary to alterations in knee biomechanics. Therefore,

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early osteoarthritis will be inevitable [1-3,5]. What makes the treatment of CAPRI so complex is the extensive ligament injury associated with this kind of instability. Injured structures are anterior cruciate ligament (ACL), lateral collateral ligament (LCL) and posterolateral complex (PLC). Posterior cruciate ligament (PCL) usually remains intact [1]. Varus deformity that accompanies this instability will stretch out any ligament reconstruction [1,3,7]. So the treatment of CAPRI has been done by correcting the knee varus, extra-articular repair or reconstruction of PLC and LCL, and finally ACL-reconstruction [1-3]. This plan, of course, entails multiple surgical procedures in two or more stages and consequently a protracted rehabilitation course. With increasing procedures on the knee, the risk of infection, stiffness, loss of motion and muscle atrophy will increase [1,2]. Hospital stay and rehabilitation course will be much longer and this, besides the psychological problems and loss of work and sport activity, will be harmful both to the patient and the health care system. The question is: "can we treat this instability with minimal rather than multiple procedures". The main argument of controversy in reviewed studies is the necessity of PLC repair [1,3,5,7]. PLC has a complex anatomy [8,9] and its repair or reconstruction is the most difficult and demanding part of CAPRI treatment [1-3,5]. On the other hand, good results have been achieved in the treatment of posterolateral instability with valgus osteotomy alone, without PLC reconstruction [1,4,6,10]. These results question the importance of PLC after varus correction. In this study, we observed the preliminary results of osteotomy and ACL-reconstruction in treating the CAPRI without reconstruction of PLC. The goal is to find a simple treatment for this complex instability that will result in fewer complications, less number and time of procedures and shorter hospital stay and rehabilitation course and consequently less economic load on both patient and health care system.

Methods

This was a clinical trial carried out on patients referred to the knee clinic, Al-Zahra hospital, Isfahan, Iran, with the diagnosis of CAPRI between 1995 and 2000. Diagnosis was made by positive lateral pivot shift test (LPST) and reverse pivot shift test (RPST). A checklist was designed and used to collect the following information: age, sex, mechanism of trauma, subjective symptoms including pain, the presence of giving way and locking before and after surgery, objective instability tests including anterior drawer test, Latchman test, LPST and RPST in terms of severity before and after surgery plus return to work and sport (complete, partial, poor). The severity of instability was graded according to the Standard Nomenclature of Athletic Injuries into three grades: mild (G_1), moderate (G_2) and severe (G_3) [1]. First, the patients underwent knee arthroscopy. In case of meniscal tearing or chondromalacia and patellar maltracking, appropriate treatment (meniscectomy and lateral release, respectively) was carried out. Next, open wedge high tibial osteotomy (HTO) was performed using iliac graft [1] and was fixed by means of 2 or 3 pins when needed. After 4 to 6 weeks, the cast was discarded and when the knee range of motion was full and the strength of quadriceps muscle was complete, an ACI-reconstruction was performed using modified Clancy technique [1] and bone-patellar tendon-bone graft. Rehabilitation was then carried out through the routine program and in an orderly fashion [1]. At the end, patients were permitted to return to sports according to Paulo's criteria [11]. After a mean follow-up of 23 months, patients were compared through subjective symptoms and objective tests with their conditions before surgery. In terms of return to work and sport, patients were allowed to fall in one of the three categories:

1- Complete: full return to work or sport without any limitations.

2- Partial: return to preinjury work or sport but limiting the activity because of the pain and/or instability.

3- Poor: discontinuing the previous work or sport in face of pain and/or instability.

Collected data were entered in SPSS software and analyzed using X^2 for comparing pain, Fisher exact test for comparing giving way and locking, and Wilcoxon test to compare instability tests, before and after surgery. P<0.05 was considered significant.

Results

Twenty nine patients (29 knees) were operated on. All were men. Mean age was 26.80 ± 1.12. The causes of instability were sports (football) in 75.9% and non-sport trauma (motor vehicle accidents) in 24.1%. The follow-up intervals ranged from 14 to 35 months (mean of 22.93 ± 1.1 SEM). Pain, was reported in 96% before and 41% after the surgery (P<0.001). Giving way was a complaint in 79.3% before but 6.9% after the operation (P<0.001). 48.3% of patients had locking preoperatively, compared to no report of such a complaint after the surgery (P<0.001). With respect to instability tests, LPST and RPST became negative after the surgery in 44.8% and 41.4% of patients, respectively (P<0.001). In the rest of patients, LPST and RPST remained positive but in mild grades. LPST and RPST were moderately to severely positive preoperatively in 79.3% and 72.4% of patients, respectively (P<0.001). Results of instability tests in terms of severity, before and after surgery, are summarized in table 1. After a mean fallow-up of 23 months, 86.2% of patients had a complete return to work and 13.8% had a partial return. Return to sports was complete in 24.1%, partial in 37.9% but poor in 37.9% of patients. No case of infection, arthrofibrosis or loss of correction was observed.

Table 1. The results of knee instability tests, before and after surgery in terms of severity (with respect to Standard Nomenclature of Athletic Injuries).

Instability test	Severity	Before surgery	After surgery*	P value
	G1	6 (20.7%)	16 (55.2%)	
Lateral Pivot Shift test	G2	23 (79.3%)	___	P<0.001
	G3	____†	___	
	G1	4 (13.8%)	23 (79.3%)	
Latchman	G2	22 (75.9%)	___	P<0.001
	G3	3 (10.3%)	___	
	G1	6 (20.7%)	21 (72.4%)	
Anterior drawer test	G2	19 (65.5%)	2 (6.9%)	P<0.001
	G3	4 (13.8%)	____	
	G1	8 (27.6%)	17 (58.6%)	
Reverse Pivot Shift test	G2	19 (65.5%)	____	P<0.001
	G3	2 (6.9%)	____	

* Patients with negative tests are not included in this table.

† It means that no patient had that grade of instability.

Discussion

In this study we evaluated the results of treatment of CAPRI, with varus correction and ACL-reconstruction alone, without repair or reconstruction of PLC. The significant improvement in giving way after surgery, showed the subjective stability that was achieved in most patients. From the objective point of view, there was a meaningful improvement in LPST and RPST, again showing the stability that was obtained. In fact, all operated patients, either had negative instability tests after surgery or showed mild degrees of instability that was assumed to be a good result compared to the results achieved by conventional treatment of CAPRI in multiple stages [1-3,5,7]. While the majority of works on CAPRI condemned to failure due to ACL-reconstruction without repair of PLC [1,3,5,12], this was not the case in our study in which

ACL-reconstruction alone, without any reconstitution of PLC, gave the stability required to the knee. This contradiction, we think, has to be stemmed from valgus osteotomy and alignment correction. Similar results have been achieved with osteotomy alone without PLC repair in the treatment of posterolateral instability [1,4,6,10]. In the two studies that La Prade performed on valgus knees, PLC rupture and insufficiency had no influence on reconstructed ACL or PCL grafts [12,13]. Noyes, also, arrived at similar results with ACL-reconstruction [3]. In all of these works and the current study, the role that PLC played in knee stability, was insignificant in the presence of valgus. This can be explained from a biomechanical point of view: in case of varus, the axis of body weight passes medial to the knee. This opens the lateral aspect of the joint. Here, PLC and LCL would play a central role in preventing varus thrust [9]. But in case of valgus alignment, the body weight axis will fall closer to the lateral side, tending to close that side of the knee. In this case, PLC and LCL will no longer be the main stabilizers, because the stability obtained is now the result of knee mechanical axis alignment rather than being a function of ligamentous tension and integrity. Another argument that seems to play a role in obtaining good results in this study is the advantage that opening wedge HTO offers over closing wedge HTO. By opening the osteotomy site at the proximal and medial side of the tibia, the tibial origin of popliteus muscle will be driven away from its insertion on the lateral femoral condyle, thus producing tension in popliteus muscle and posterior oblique ligament. This will stiffen the arcuate and popliteofibular ligaments and therefore, enhances the strength in the whole posterolateral corner. It is hypothesized that this mechanism helps making the knee stable in flexion and thus RPST becomes negative. Other advantages of the open wedge HTO include the preservation of limb length and less risk to harm peroneal nerve. Disadvantages are the higher risk of nonunion and the added morbidity that a graft harvest from ileum will bring on. Nonetheless, there were no such problems in our patients. Recently, in order to decrease the problems caused by graft harvest from ileum, prefabricated wedge-shaped hydroxyapatite grafts have come into use [14]. Although improvement in pain was not as significant as improvement in instability, the pain was mild and was not considered a serious factor in limiting the activity (work or sports). This is identical to other works on knee instabilities where improvement in pain was inferior to improvement in instability signs and symptoms [3,5,7,15,16] and it seems to be a result of coexisting chondral lesions and chondromalacia that are unaffected by the treatment of instability. While about half of patients complained of locking before surgery, none had such a complaint after surgery, and this was due to the concurrent meniscectomy performed at the time of arthroscopy. All of the patients in this study returned to their work and most of them (61.1%) were able to resume their preinjury sports. This is similar to previous studies on ACL-reconstruction [15,16]. The cause of incomplete return to sports seemed to be a fear of rerupture rather than the pain or instability. As a result of the most delicate and complex anatomy of PLC, repair or reconstruction of this region is a demanding process that can be accomplished only by a trained knee surgeon. Even then, the results will be unpredictable [4,5,10]. ACL-reconstruction, on the other hand, is a relatively easy procedure that can be carried out by the majority of orthopedic surgeons. With ACL-reconstruction alone, and without further manipulation on extra-articular structures like PLC and LCL, not only the length and the number of operations will be reduced but also the rehabilitation will be shorter and easier. Considering the discussion above and the results achieved in this study, ACL-reconstruction alone after varus correction is recommended as the treatment of CAPRI. Of course, these results are preliminary and were obtained in short term. By performing comparative studies with larger samples and

evaluation of results in long term, and also by using more sophisticated tools to quantify instability and ligament function (like arthrometer KT-1000), a more comprehensive approach can be made in order to manage this complex instability of the knee.

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