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Outcomes of Non operative Treatment of Isolated, Acute Posterior Cruciate Ligament (PCL) Injury

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1. Abstract

1.1. Objectives: The aim of this study is to evaluate the results of non-operative treatment of acute, isolated PCL injury.

1.2. Study Design: Prospective Observational Study.

1.3. Setting: Orthopedics and spine unit, Hayatabad Medical Complex, Peshawar.

1.4. Method: 63 patients who had post traumatic PCL injury were recruited for our study). There were 23 partial PCL injuries and 40 total PCL injuries among the 63 knees. These 63 knees were subjected to a thorough subjective, objective, functional, and radiological examination.

1.5. Results: There was no discomfort in 38 knees (60%), mild pain in 14 knees (22%), and significant pain on exercise in 6 (9.5%) knees at the most recent follow-up examination (10 percent). In 54 knees (93%), there was no swelling, mild, intermittent swelling in three knees (5%), and moderate swelling on exertion in one knee (2 percent). Fifty-two patients (91%) experienced no giving way, whereas five patients (9%) complained of giving way on occasion, especially while walking downstairs.

1.6. Conclusion: We currently believe that patients with acute, isolated, complete PCL tears and up to 10 mm of posterior tibial translation (anterior border of tibial plateau flush with anterior surface of femoral condyles with knee in 90-degree flexion) can be treated non operatively and that the majority of patients can achieve a satisfactory functional result.

2. Introduction

In comparison to anterior cruciate ligament injuries, Posterior Cruciate Ligament (PCL) injuries are uncommon in clinical practice. According to reports, PCL injuries account for 1 to 50 % of all acute knee ligament injuries [1–9]. According to Clancy and Sutherland, up to 40% of PCL injuries are isolated injuries. PCL injuries have been more common in recent years, presumably as a result of a rise in the frequency of traffic accidents, increasing engagement in leisure and competitive sports, and enhanced awareness and clinical diagnostic abilities [10]. Isolated PCL injuries are routinely overlooked during physical examinations of the knee, according to some doctors [11–13]. The majority of PCL injury reports are retrospective investigations of acute and chronic PCL injuries with a mixed population of solitary and combined ligamentous injuries of the knee [5, 11, 12, 14–28].

It's impossible to draw any conclusions about the best way to treat individuals with acute, isolated PCL injuries based on these data. The results of non-operative therapy of isolated PCL rips have been documented by a number of writers [6, 13, 20, 23, 25, 28–37].

The goal of this retrospective study is to describe the clinical, radiological, and functional outcomes of non-operative treatment of individuals with acute, isolated PCL injuries.

The non-operative management of individuals with acute, isolated PCL damage of the knee is the focus of our research.

3. Methodology

The senior expert treated a total of 75 patients with acute, isolated PCL injuries between January 2010 and December 2020. This study excluded patients with knee dislocations, chronic PCL injuries, and concomitant injuries (to the posterolateral corner or the medial part of the knee). Patients who had a bony avulsion of the

PCL's tibial or femoral attachment were also excluded from the research. Non-operative treatment included quadriceps muscle therapy with or without bracing for all patients. All patients were given a home-based rehabilitation programmer with an emphasis on increasing knee Range of Motion (ROM) and lower limb strength.

Twelve of the 75 patients were unable to be tracked down for follow-up. In the year 2020, one author analyzed 63 patients (63 knees) (DVP). There were 23 partial PCL injuries and 40 total PCL injuries among the 63 knees. These 63 knees were subjected to a thorough subjective, objective, functional, and radiological examination. At the time of follow-up, these individuals were not seeking therapy for their knee complaints, reducing selection bias.

The patients were on average 31.5 years old when they were diagnosed with PCL damage (range 13 to 49 years). There were 49 males and 14 women in attendance. In 42 instances, the right knee was affected, whereas the left knee was involved in 21. (Table 1) shows the specifics of the injury's a etiology. Prior to the accident, the majority of the patients were active in leisure and competitive athletic activities

Table 1: The specifics of the injury's a etiology.

No Pain	Mild Pain	Sever Pain
38 knees	14 Knees	6 Knees

All of the patients were examined between two to forty days of the initial injury, and they all felt discomfort with or without knee swelling, as well as problems with everyday activities or sports. At the time of initial examination, the average knee flexion was 125 degrees (range 95 to 140 degrees) and the average extension loss was 2-degrees (range 0 to 10-).

The subjective evaluation comprised the Lysholm-II knee score as reported by Tegner and Lysholm [38], the Tegner activity level, and the Lysholm-II knee score as reported by Tegner and Lysholm [38]. and the International Knee Documentation Committee (IKDC) assessment [39] Lysholm and Gillquist [40] published the original Lysholm score in 1982. The Lysholm-II knee score is a variant of the Lysholm knee score. As indicated by Odensten et al. [41], the Lysholm-II knee score was classified as excellent, good, fair, or bad. Patients with a score of 91–100 were considered exceptional, 77–90 were considered acceptable, 68–76 were considered fair, and 68 were considered bad. The IKDC form [39] is divided into four sections (subjective assessment, symptoms, ROM, and ligament examination). Each variable is categorized as normal, almost normal, abnormal, or extremely abnormal. For grading purposes, the findings of the four areas are considered. The group qualification is determined by the parameter's worst qualification. The final rating is based on the group with the weakest performance.

In addition to the grading methods indicated above, patients were asked to subjectively score their knees' performance in activities of daily living and sports on a scale of 0 (poor) to 100 (excellent) (normal). Physical examination and evaluation with the KT-1000 arthrometer (Med Metric, Inc., San Diego, CA, USA) were used for the objective assessment [42]. The ROM, effusion, joint-line pain, crepitus, concomitant laxity of other ligaments (if any), posterior sag of the tibia, posterior drawer test, pivot shift test, and reverse pivot shift test [43] were all noted during a thorough physical examination of both knees. The thigh atrophy was compared to that of the contralateral normal knee at a position 10 cm proximal to the superior pole of the patella. We feel that the usual grading method of 1+, 2+, and 3+ for the posterior drawer is fundamentally confusing since it relies on the examiner's subjective judgement of the amount of millimeters of tibia posterior translation on the femur. Noyes et al. [44] have completely abandoned this grading scheme. Based on the evaluation of the posterior drawer test done with the knee in 90-degree flexion, we developed a more streamlined clinical grading system.

The grading system is:

4. Normal

No loss of tibial offset.

4.1. Grade A: Slight loss of tibial offset when applying a posterior force to the tibia with the knee at 90- of flexion

4.2. Grade B: The tibia is flush with the femur.

4.3. Grade C: The tibia is able to be displaced behind the femur

This grading method, in our opinion, has proven more repeatable in our clinic since it depends on tibia displacement relative to fundamental landmarks rather than displacement based on millimeters. MacGillivray et al. [45] reported on the usage of this simple and effective grading method. We looked at individuals with grade A (partial) and grade B (full) PCL injuries in this research. Additional damage to the posterolateral corner or the medial portion of the knee is common with Grade C PCL injuries. Patients having an accompanying injury to the posterolateral corner or medial aspect of the knee were omitted from our analysis since the focus of our work is on nonoperative management of patients with acute, isolated PCL injuries. Because the instrumented device was not accessible for patients evaluated between 1977 and 1988, preoperative KT-1000 readings were not achievable for all of them. The KT-1000 measurements were done following the approach described by Daniel et al. [42] during the most recent follow-up. On the non-injured side, the quadriceps neutral angle was first established. Then, with both knees flexed to the quadriceps at a neutral angle, the following measures were taken: posterior laxity from the resting position using 89 N posterior force, and active anterior translation (with quadriceps contraction) from the resting position. The adjusted posterior drawer laxity was calculated by combining the findings of both of these measures. For both patellae, anteroposterior weight bearing view, 45- posteroanterior flexion weight bearing view [46], lateral view, and Merchant s view [47] were used in the radiography examination. The radiographs were graded as follows: grade 0, normal; grade I, mild degenerative changes (less than 2 mm of apparent joint space narrowing and the presence of small intercondylar or pericondylar osteophytes); grade II, moderate degenerative changes (2 to 3 mm of apparent joint space narrowing, per articular sclerosis, and the presence of intercondylar or pericondylar osteophytes); grade III, severe degenerative changes (2 (more than 3 mm of narrowing of the apparent joint space, and the presence of extensive osteophytes). At the time of the initial outpatient appointment, none of the patients exhibited favorable radiographic changes in their knees.

A radioisotope (Technetium 99m methylene diphosphonate) bone scan was ordered for each of the 57 individuals. Twenty patients agreed to have their bones scanned. The goal of the bone scan was to see if there were any early signs of degenerative changes in the knee. We asked the patients whether they wanted a bone scan regardless of whether or not they had any clinical symptoms. Seventeen of the twenty patients were chosen at random from the database for a bone scan, while the remaining three had a bone scan due to persistent knee symptoms. These three individuals were asymptomatic at first, but developed clinical symptoms 28 months (range 22 to 32 months) after the original damage. A complete history and physical examination were used to diagnose PCL tear in 10 knees, with the inclusion of Magnetic Resonance Imaging (MRI) in 42 knees and arthroscopic assessment in 21 of the 58 knees. Overall, 15 of the 58 knees had both an MRI and an arthroscopic examination, whereas 10 of the 58 knees had neither an MRI nor an arthroscopic examination; the diagnosis was determined by physical examination in the latter group. On the basis of arthroscopic results and MRI investigations, a differentiation between partial and total PCL injuries was determined. Eight knees had a partial PCL tear and 40 knees had a total PCL tear out of the 48 who received an MRI and/or arthroscopic examination. Nine of the ten knees examined simply by physical examination had a grade A (partial) PCL damage, whereas one had a grade B (full) PCL injury. Overall, 17 knees had a grade A (partial) PCL tear and 41 knees had a grade B (full) PCL rupture based on physical examination, MRI, and arthroscopic assessment.

An MRI was available for 42 of the 58 knees at the time of the first injury. MRI was used in the early stages of our research to identify concomitant meniscal and/or chondral injury, as well as to validate the clinical diagnosis of PCL rupture. According to MRI findings, six knees had a partial PCL tear and 36 knees had a total PCL tear. An arthroscopic examination was performed on 21 of the 58 knees for suspected meniscal and/or chondral damage. Two knees had a partial PCL tear and 19 knees had a total PCL tear, according to arthroscopic examination. At the time of the original PCL injury, six of the twenty-one knees undergoing arthroscopic assessment had concomitant meniscal tears (4 medial and two lateral). The arthroscopic partial meniscectomy was used to repair all six meniscal injuries while maintaining a stable rim. While playing football, one patient had a bilateral PCL injury on two different occasions. In both knees, an arthroscopy revealed a grade IV chondral lesion (exposed subchondral bone). Arthroscopic debridement and curettage at the crater's base were used to treat these lesions. Two other patients experienced a grade II chondral injury to the medial femoral condyle and retro patellar surface (as seen during arthroscopy) at the time of the first injury (a partial thickness defect with cracks on the surface that do not penetrate subchondral bone or surpass 1.5 cm in diameter). There were no meniscal lesions in any of these three individuals with chondral lesions.

5. Analysis

The data were statistically analyzed using Chi-square analysis, Student's t test, Pearson's correlation coefficient, and Spearman's rank correlation coefficient. For unpaired data, the Mann–Whitney U test (two groups) was utilized. A p value of less than 0.05 was considered significant.

6. Results

There was no discomfort in 38 knees (66%), mild pain in 14 knees (24%), and significant pain on exercise in 6 knees at the most recent follow-up examination (10%). In 54 knees (93%), there was no swelling, mild, intermittent swelling in three knees (5%), and moderate swelling on exertion in one knee (2 percent). Fifty-two patients (91%) experienced no giving way, whereas five patients (9%) complained of giving way on occasion, especially while walking downstairs. We discovered that these patients mostly complained of Buckling of the knee when moving downhill, rather than real rotatory giving way as observed with twisting, cutting, or pivoting tasks, after further inquiry.

Sixteen patients (28%), on average, complained of knee stiffness on occasion. Five patients (9%) showed minor issues with stop/start activities, while 13 (23%) had minor issues with jump/land activities.

6.1. Post Treatment Results

Eleven patients (19%) had little difficulties walking, particularly on uneven ground. None of the patients experienced significant walking difficulties and none required the use of a cane. While running, 12 patients (21%) experienced minor issues. Eight individuals (14%), on average, complained of minor stair discomfort. There was no need for a bannister for any of the patients.

6.2. Subjective Assessment

At the time of the original PCL injury, the Lysholm-II knee score was unavailable. The average Lysholm-II knee score was 85.2T10 at the most recent follow-up (range 51 to 100). The findings were outstanding in 23 knees (40 percent), good in 30 knees (52 percent), fair in 2 knees (3 percent), and bad in 3 knees, according to the LysholmII knee score grading method described by Odensten et al. [41]. (5 percent). Tegner activity levels were 7 on average before the injury (range 4 to 10). The mean Tegner activity level was 6.6T1.8 at the most recent follow-up (range 3 to 10). The single-legged hop test was used to assess functional ability. The PCL-deficient knee's average hop distance was 132T27 cm (range 37 to 196 cm). The hop distance ratio for the affected and noninvolved extremities was 0.95.

7. Objective Findings

7.1. Physical Examination

Despite the fact that four patients reported subjective knee swelling, only one patient had a palpable, modest effusion in the knee at the time of the most recent evaluation. There was no discomfort along the medial or lateral joint lines in any of the individuals. In 19 knees, there was no thigh atrophy. When compared to the opposite extremity, thirty knees had between 0.5 and 1 cm of thigh atrophy, eight had between 1.5 and 2 cm of thigh atrophy, and one had >2 cm of thigh atrophy. In the PCL-deficient knee, the average flexion was 138 degrees (range 130 to 150 degrees) and the average extension loss was 1-degree (range 0 to 4-). The posterior drawer test revealed grade A (partial PCL tear) in 14 knees and grade B (full PCL rupture) in 44 knees (with the knee flexed at 90 degrees and the tibia in neutral rotation). At the most recent follow-up, none of the knees had a clinically determined grade C PCL laxity. One notable clinical result in this investigation was that when the posterior drawer test was conducted at 90 degrees of knee flexion with the tibia in internal rotation, the posterior translation of the tibia reduced in all 58 knees. During a physical examination, the tibiofemoral step-off was clinically graded using our grading system for PCL injuries. At the follow-up, none of the patients demonstrated abnormal medial or lateral collateral ligament laxity. When compared to the opposite normal extremity, none of the patients exhibited a positive external rotation recurvatum test [48] or a positive reverse pivot shift test [43].

(Table 2) shows the details of the KT-1000 evaluation findings at the most recent follow-up. The tibia's mean corrected posterior translation was 7.9T1.6 mm (range 5 to 11 mm). The average side-to-side discrepancy between the damaged knee and the non-injured knee was 5.6T1.4 mm (range 3 to 9 mm). (Table 3)

Table 2: The details of the KT-1000 evaluation findings at the most recent follow-up

No Swelling	Mild Swelling	Severe Swelling
54 knees	3 knees	1 knee

Table 3:

No Feeling of knee Giving way	Feeling of knee Giving Way
52 knees	5 knees

8. Radiographic Findings

8.1. Plain Radiographs

Degenerative alterations in the medial compartment were found in ten (17%) of the 58 knees at the most recent follow-up. Mild (grade I) degenerative alterations were observed in seven of the ten knees, whereas significant (grade II) degenerative changes were observed in three of the ten knees. There were no degenerative changes in any of the knees that were grade III (severe). Four knees had mild patellofemoral Osteo Arthritis (OA) (7 percent). In five cases, the opposing knee exhibited minor (grade I) degenerative abnormalities (three involving the medial compartment and two involving the lateral compartment). Three individuals exhibited minor (grade I) degenerative alterations in the contralateral knee's patellofemoral joint. The duration of follow-up was linked to the degree of degenerative alterations in specific compartments of the knee.

8.2. Return to Sports

Six of the patients have played professional football in the NFL. These six players are no longer active. Before retiring, all six players were active in the NFL for a total of 121.6 months (range 86 to 160 months). One of the patients completed two Ironman Triathlons. Thirty-seven patients (or 65 percent) were able to resume leisure activities. Twenty-four of the 37 patients were able to play at their pre-injury level, while 13 were able to play at a lower level. Five patients participated in other sports than before the injury, and eight had reduced or discontinued participating in sports for reasons unrelated to the PCL injury, such as a change in lifestyle and interests with age or a hectic job schedule.

While playing football, one patient (a professional NFL player) had bilateral PCL injuries (on different occasions). In both knees, an arthroscopic examination revealed a grade IV chondral lesion (exposed subchondral bone) in the medial femoral condyle. To improve vascularity and encourage healing, the chondral lesions in both knees were treated with debridement and drilling of the subchondral bone. There has been no PCL repair for this patient to far. He is currently retired from professional football and lowered his level of engagement. When he exerts himself, he experiences slight discomfort and swelling in both knees. He enjoys playing basketball and running in his spare time.

8.3. Non-operative Treatment Failures

Because of clinical progression of symptoms in two patients, conservative therapy was abandoned, and PCL reconstruction was performed on both of these athletically active patients who had grade B initial PCL laxity. These two patients had PCL reconstructions 26 and 34 months after their initial injury, respectively. At 102 months following the PCL repair, one patient was evaluated and found to have a great functional outcome (Lysholm-II knee score 94). In his spare time, he enjoys playing softball and tennis.

At 38 months following PCL surgery, the other patient was seen. He has an excellent functional result (Lysholm-II knee score of 86) and enjoys recreational running, cycling, tennis, and football. At the most recent evaluation, the degree of degenerative alterations on plain radiographs had not worsened.

At 71 months following the first PCL damage, one patient re-injured his knee as a consequence of a fall. A progressive tear in the posterior section of the medial meniscus was discovered during arthroscopy and was treated with partial meniscectomy. A peripheral rupture of the posterior third of the lateral meniscus was also discovered, necessitating arthroscopic lateral meniscal repair. The medial femoral condyle showed grade II chondral alterations. At 114 months after the initial PCL damage, the patient had no meniscal problems and adequate knee function.

9. Correlation with Findings

There was no statistically significant relationship between the prevalence of pain and the length of follow-up (p>0.05). The Lysholm-II knee score and objective PCL laxity had no statistically significant connection (p=0.097). The average Lysholm-II knee score for patients with grade A PCL laxity was 84.2T12.3, whereas the average Lysholm-II knee score for patients with grade B PCL laxity was 85.6T9.2. The KT-1000 findings had no significant link with the Lysholm-II knee score (p>0.05).

The period of follow-up had no significant relationship with Lysholm-II knee scores (Pearson s correlation r=j0.14, p=0.3; Spearman rank correlation=j0.1, p=0.5;). We linked the age of the patients at follow-up versus Lysholm-II knee score to rule out the influence of advancing age on knee function. There was no link between patients' age and the Lysholm-II knee score (Pearson's correlation r=j0.14, p=0.5).

There was no significant link between Lysholm-II knee score and radiographic degenerative changes (Student s t test=j0.5, p=0.6; Mann–Whitney U test, p=0.13). Similarly, there was no link between the degree of PCL laxity and radiographic degenerative alterations (chi-square=2.2, p=0.1). There was no link between the length of follow-up and the severity of radiological degenerative alterations (p=0.5).

The objective PCL laxity (as determined by physical examination) and the KT-1000 arthrometer results of PCL laxity were statistically significant (p0.05). On radiographs, there was no link between the KT-1000 results and the existence of discomfort, giving way, or degenerative changes.

10. Discussion

The real frequency of isolated PCL injuries is thought to be difficult to estimate since many of these injuries are overlooked during the initial physical examination. It's probable that many people with undetected PCL ligament problems haven't been compelled to seek medical counsel [20, 25]. For an appropriate diagnosis, a strong index of suspicion and a thorough understanding of the physical examination procedures are required. A careful history and a thorough physical examination, we believe, can be used to accurately diagnose acute, isolated PCL rips. Rubinstein et al. [49] studied the accuracy of the clinical evaluation in the situation of isolated, chronic PCL tears in a blinded, randomized, and controlled trial. The accuracy for diagnosing a PCL tear was 96 percent, with 90 percent sensitivity and 99 percent specificity, according to their findings.

Non-operative therapy of the PCL-deficient knee has been documented by a number of writers [6, 13, 20, 23, 25, 28–37]. At a mean follow-up of 13.4 years, Boynton and Tietjens [33] retrospectively assessed 38 patients with isolated, non-operatively treated PCL injuries (range 5 to 38 years). They came to the conclusion that the prognosis for isolated PCL-deficient knees is diverse; some patients have considerable symptoms and articular degeneration, while others are mostly asymptomatic and preserve their normal knee function. A prospective study of the natural history of acute, isolated, non-operatively treated PCL-deficient knees in 133 patients was published by Shelbourne et al. [34]. After the initial recording of the PCL injury, the average follow-up was 5.4 years (range 2.3 to 11.4 years). They came to the conclusion that individuals with acute, isolated PCL injuries may be handled non-operatively, and that in most cases, acceptable knee function can be achieved.

We feel that the usual grading method of 1+, 2+, and 3+ for the posterior drawer is fundamentally confusing since it relies on the examiner's subjective judgement of the amount of millimeters of tibia posterior translation on the femur. Frequently, published papers may list posterior drawer results as 1+, 2+, or 3+ and confuse these numbers with PCL grades 1, 2, 3, or 4, without identifying the tibia's position in regard to the femur. Noyes et al. [44] have completely abandoned this grading scheme. B. PCL rips are separated into two categories based on the millimeters of increased posterior tibial displacement, suggesting either undamaged (10 mm) or inadequate (>10 mm) secondary constraints, according to Noyes et al. [44]. This divide is rather arbitrary since it is impossible to verify the exact increase in posterior tibial translation with PCL ruptures without utilizing stress radiography under defined loading circumstances.

As a result, we developed a more straightforward grading system for the posterior drawer test. The system has no way of knowing if an injury is partial or total. Rather, it evaluates the strength of any ligament or ligament remnant present. This grading approach, in our perspective, has proven more repeatable in our clinic since it depends on tibia displacement relative to fundamental landmarks rather than displacement based on millimeters. MacGillivray et al. [45] reported on the usage of this simple and useful clinical grading system.

Physicians have argued, and will continue to argue, over the severity of PCL damage in the grade B or C categories. The occurrence of partial injuries, as well as the fact that PCL injuries frequently heal in an extended, nonfunctional condition, make this more difficult. As a result, assessing injury severity is rather arbitrary, and a method that simply reports the location of the tibia on the femur will be easier to use and minimize reporting biases.

We are aware that there is no evidence in the literature to suggest that grade A PCL laxity always results in a partial tear and grade B PCL laxity always results in a full tear. At the time of the original injury, 17 knees had grade A PCL laxity and 41 knees had grade B PCL laxity in our research. 14 knees exhibited grade A PCL laxity and 44 knees had grade B PCL laxity at the most recent follow-up. Patients with grade A PCL laxity had a mean Lysholm-II knee score of 84.2 points, while patients with grade B PCL laxity had a mean Lysholm-II knee score of 85.6 points, despite objectively observable PCL laxity.

When the posterior drawer test was done with the tibia in 20 degrees of internal rotation compared to posterior translation of the tibia performed with the tibia in neutral rotation, there was an expected reduction in posterior translation of the tibia. This was discovered in all 58 knees that were evaluated. Because we did not use the KT-1000 arthrometer to objectively evaluate the decrease in posterior tibial translation, it is impossible to remark on the precise amount of reduction in posterior tibial translation that occurs with the tibia in 20 degrees of internal rotation. JA Bergfeld made a similar clinical discovery in the early 1980s (Bergfeld, personal communication, 1997), and he has continuously noticed this finding in his clinical practise since then.

The KT-1000 arthrometer was shown to be accurate in identifying and evaluating PCL laxity in the current investigation. The objective PCL laxity (as noticed on physical examination) and the results of PCL laxity as evaluated by the KT-1000 arthrometer had a statistically significant association (p0.05). The KT-1000 arthrometer, we feel, may be utilized to objectively document the grade of PCL laxity and is valuable for further follow-up exams. We are aware that stress radiography [50, 51] can be employed to objectively document the PCL damage. Our series, however, did not include stress radiography of the knee.

After non-operative treatment of acute, isolated PCL injuries in our study, 40 percent of the knees had an outstanding outcome, 52 percent had a good result, 3% had a fair result, and 5% had a bad result based on the Lysholm-II knee score.

Patients with poor clinical outcomes were mostly involved in hard manual labour and were unable to undertake jobs that required deep knee squatting and kneeling. The mean Lysholm-II knee score was 85.2 (range 51 to 100) at the most recent follow-up, while the mean Tegner activity level was 6.6. (range 3 to 10). Based on these findings, we conclude that individuals with acute, isolated grade A and grade B PCL laxity perform well with non-operative therapy following an average follow-up of 6.9 years (range 2 to 19.3 years) after diagnosis.

It's difficult to tell which individuals with an acute, isolated PCL tear will benefit from non-operative therapy and which ones will not. Patients with an isolated, partial, or total lesion to the PCL typically have good functional outcomes when treated non-operatively, according to other authors [6, 13, 20, 23, 25, 28– 30, 32–37]. If longer-term follow-up reveals more progressive degradation, an argument for early surgery reconstruction might be made.

None of the knees had a normal result, 6 had a nearly normal result, 51 had an abnormal result, and one knee had a significantly abnormal result, according to the IKDC evaluation [39]. These results appear to be disappointing at first look, and they do not appear to correspond well with the Lysholm-II knee score stated previously. The IKDC form [39] primarily covers four sections, as previously discussed under the B Materials and techniques part (subjective assessment, symptoms, ROM, and ligament examination). Each criterion is assigned a rating of normal, almost normal, abnormal, or extremely abnormal.

For grading purposes, the findings of these four areas are used. The group qualification is the poorest qualification within the criteria, and the final assessment is the worst group qualification. After thorough consideration, we discovered that the group qualification 4 was the primary drawback of adopting the IKDC form for overall rating of results of non-operative treatment of PCL injuries in our study (ligament examination).

Patients with a 3- to 5-mm (i.e., grade A) posterior translation of the tibia will have a nearly normal result, while those with a 6-to 10-mm (i.e., grade B) posterior translation of the tibia will have an abnormal result, despite the fact that the patient has no symptoms and excellent knee function with activities of daily living and sports. According to the findings of our study, there is no link between objective PCL laxity and Lysholm-II knee score (p=0.097). As a result, we consider that grading the success of non-operative PCL injury therapy exclusively using the IKDC knee evaluation form may be improper.

There was no link between the Lysholm-II knee score and the length of follow-up in our investigation. In other words, regardless of the period of follow-up after the initial injury, the Lysholm-II knee scores were roughly the same Torg et al. [25] discovered no link between the period since the injury and the knee's functional result. The Lysholm-II knee score and objective PCL laxity were shown to have no connection. In other words, Lysholm-II knee scores were equivalent in patients with grade A or grade B PCL laxity.

Dandy and Pusey [20], Cross and Powell [12], Shelbourne et al. [34], and Shelbourne and Muthukaruppan [37] also found no correlation between the objective PCLlaxity (as determined by posterior drawer test) and kneefunction. Torg et al. [25] reported that there was nocorrelation between posterior knee laxity (as measured bya KT-1000 arthro meter) and the functional status of the patient.

Geissler and Whipple [52] found a high frequency of intraarticular anomalies in individuals with PCL injuries. Patients with both acute and chronic PCL injuries were included in the research. It's impossible to say if all of the meniscal lesions they looked at were clinically significant and symptomatic. Furthermore, they did not offer a control group of patients in their research. Because most studies have reported the results of PCL tears mixed with other ligamentous injuries, and because the results are mostly based on physical examination rather than direct observation at surgery [5, 6, 13, 15, 18, 22], it's difficult to determine the true prevalence of meniscal abnormalities in patients with isolated PCL injuries. In our study, six of the twenty-one patients who underwent arthroscopic assessment had concomitant meniscal tears (4 medial and two lateral) at the time of injury. During the research period, which spanned 2 to 19.3 years, just one patient suffered a later meniscal tear. Based on this information, we conclude that in individuals with acute, isolated, non-operatively treated PCL injuries, future meniscal tears are uncommon. Those with unidirectional, isolated PCL instability, in contrast to patients with ACL deficit, do not exhibit rotational instability and, as a result, are less likely to incur meniscal injury. Several studies [32, 52– 54] have discovered a link between articular cartilage degradation and PCL injury. It's likely that chondral damage acquired at the time of the initial PCL injury altered the knee's eventual functional outcome in our study. In the current investigation, arthroscopic assessment was performed on 21 of the 58 knees at the time of injury. It's probable that the remaining 37 knees that didn't get arthroscopy had varied degrees of chondral injury.

However, chondral or osteochondral damage was not seen in 42 of the 58 knees that received MRI examination at the time of the original injury. It's worth noting that these were early MRI studies, so they weren't as good at detecting chondral damage.

Various publications have shown degenerative alterations in the medial compartment and patellofemoral joint in individuals with PCL deficiency [5, 6, 22, 31]. Some authors [10, 30, 33] have claimed that progressive arthrosis should be expected following a PCL injury; however, the conclusions from these studies were based in large part on populations of patients with acute and chronic, isolated and combined PCL injuries, and these populations were frequently symptomatic patients seeking treatment. In a biomechanical study involving ten cadaveric knees, Skyhar et al. [55] found that after sectioning the PCL, medial compartment pressure was significantly elevated, whereas patellofemoral pressures and quadriceps load were significantly elevated after combined sectioning of the PCL and the posterolateral complex. Seven knees exhibited mild degenerative changes in the medial compartment, three knees had moderate degenerative changes in the medial compartment, and four knees had mild degenerative changes in the patellofemoral joint after a mean follow-up of 6.9 years in the current investigation, based on plain radiographs. Furthermore, a normal radioisotope bone scan was found in 17 of the 20 knees (chosen at random from the database). This is a positive finding, in our opinion. To remark on the prevalence of degenerative alterations and symptoms in a PCL-deficient knee, more long-term follow-up of the patients in our research is required.

According to Dejour et al. [30], at least 15 to 20 years, if not more, might pass between the appearance of chondral lesions and the onset of established OA of the knee. The duration of follow-up (i.e., time gap from the initial PCL injury) had no effect on the degenerative alterations found on plain radiographs in our investigation. A similar discovery was previously reported by Parolie and Bergfeld [6] and Torg et al. [25]. There was no association between radiographic data and PCL laxity grade or the Lysholm-II knee score in our investigation.

There are certain limitations to our research. For starters, this is a retrospective research, which is known to have inherent selection bias. Second, this study's average follow-up period is 6.9 years. It would be beneficial to have more data on our patient group over a longer period of time. Our study has the advantage of focusing on the outcome of non-operative care of a single group of patients with acute, isolated PCL damage. Prospective, long-term, and controlled trials comparing the results of non-operative therapy with the results of surgical repair for isolated PCL injuries should be included in future research. Such investigations should aid in the refinement of existing treatment guidelines for acute, isolated PCL-deficient knees. Until then, the results of non-operative care of acute, isolated PCL deficit will serve as a benchmark against which PCL reconstructive surgery results may be evaluated.

11. Conclusion

The results of non-operative therapy for acute, isolated (partial or total) PCL deficiency knee are presented. The clinical, radiological, and functional outcomes of 57 individuals (58 knees) with acute, isolated PCL injuries were presented. The patients were followed for an average of 6.9 years (range 2 to 19.3 years). To develop a suitable treatment approach, a clear distinction between an isolated PCL injury and a combination of ligamentous injuries must be determined. We currently believe that patients with acute, isolated, complete PCL tears and up to 10 mm of posterior tibial translation (anterior border of tibial plateau flush with anterior surface of femoral condyles with knee in 90-degree flexion) can be treated non-operatively and that the majority of patients can achieve a satisfactory functional result at an intermediate-term follow-up. There was no association between the degree of PCL laxity and subjective knee function in this investigation.

Reference

1. O-Donoghue DH. Surgical treatment of injuries toligaments of the knee. JAMA. 1959; 169: 1423–31.
2. Clendenin MB, DeLee JC, Heckman JD. Interstitial tearsof the posterior cruciate ligament of the knee. Orthopedics. 1980; 3: 764–72.
3. DeHaven KE. Diagnosis of acute knee injuries with hemarthrosis. Am J Sports Med. 1980; 8: 9–14.
4. Lysholm J, Gillquist J. Arthroscopic examination of the posterior cruciate ligament. J Bone Joint Surg [Am]. 1981; 63: 363–6.
5. Hughston JC, Degenhardt TC. Reconstruction of the posterior cruciate ligament. Clin Orthop Relat Res. 1982; 164: 59–77.
6. Parolie JM, Bergfeld JA. Long-term results of non operative treatment of isolated posterior cruciate ligament injuries inthe athlete. Am J Sports Med. 1986; 14: 35–8.
7. Johnson JC, Bach BR Jr. Posterior cruciate ligament [Current concepts review]. Am J Knee Surg. 1990; 3: 143–153.
8. Fanelli GC, Giannotti BF, Edson CJ. The posterior cruciate ligament arthroscopic evaluation and treatment [Currentconcepts review]. Arthroscopy. 1994; 10: 673–88.
9. Schulz MS, Russe K, Weiler A, Eichhorn HJ, Strobel MJ. Epidemiology of posterior cruciate ligament injuries. Arch Orthop Trauma Surg. 2003; 123: 186–91.
10. Clancy WG Jr, Sutherland TB. Combined posterior cruciate ligament injuries. Clin Sports Med. 1994; 13: 629–47.
11. Trickey EL. Rupture of the posterior cruciate ligament of the knee. J Bone Joint Surg [Br]. 1968; 50: 334–41.
12. Cross MJ, Powell JF. Long-term followup of posterior cruciate ligament rupture: a study of 116 cases. Am J Sports Med. 1984; 12: 292–7.
13. Fowler PJ, Messieh SS. Isolated posterior cruciate ligament injuries in athletes. Am J Sports Med. 1987; 15(6): 553–7.
14. Kennedy JC, Grainger RW. The posterior cruciate ligament. J Trauma. 1967; 7: 367–77.
15. Hughston JC, Bowden JA, Andrews JR, Norwood LA. Acute tears of the posterior cruciate ligament. Results of operative treatment. J Bone Joint Surg [Am]. 1980; 62: 438–50.
16. Trickey EL. Injuries to the posterior cruciate ligament: diagnosis and treatment of early injuries and reconstruction oflate instability. Clin Orthop Relat Res. 1980; 147: 76–81.
17. Fleming RE Jr, Blatz DJ, McCarroll JR. Posterior problems in the knee. Posterior cruciate insufficiency and posterolateral rotatory insufficiency. Am J Sports Med. 1981; 9: 107–13.
18. Loos WC, Fox JM, Blazina ME, Pizzo WD, Friedman MJ. Acute posterior cruciate ligament injuries. Am J Sports Med. 1981; 9: 86–92.
19. Balkfors B. The course of knee-ligament injuries. ActaOrthop Scand Suppl. 1982; 198: 1–99.
20. Dandy DJ, Pusey RJ. The long-term results of unrepairedtears of the posterior cruciate ligament. J Bone Joint Surg [Br]. 1982; 64: 92–4.
21. Bianchi M. Acute tears of the posterior cruciate ligament: clinical study and results of operative treatment in 27 cases. Am JSports Med. 1983; 11: 308–14.
22. Clancy WG Jr, Shelbourne KD, Zoellner GB, Keene JS, Reider B, Rosenberg TD. Treatment of knee joint instability secondary to rupture of theposterior cruciate ligament. Report of a new procedure. J BoneJoint Surg [Am]. 1983; 65: 310–22.
23. Satku K, Chew CN, Seow H. Posterior cruciate ligamentinjuries. Acta Orthop Scand. 1984; 55: 26–9.
24. Tibone JE, Antich TJ, Perry J, Moynes D. Functional analysis ofuntreated and reconstructed posterior cruciate ligament injuries.Am J Sports Med. 1988; 16: 217–23.
25. Torg JS, Barton TM, Pavlov H, Stine R. Natural history ofthe posterior cruciate ligament-deficient knee. Clin Orthop RelatRes. 1989; 246: 208–16.
26. Barrett GR, Savoie FH. Operative management of acutePCL injuries with associated pathology: long-term results. Orthopedics. 1991; 14: 687–92.
27. Whipple TL, Ellis FD. Posterior cruciate ligament injuries. Clin Sports Med. 1991; 10: 515–27.
28. Flandry FC, Wolfe MW, Martino JA, et al. The natural history of the posterior cruciate ligament-deficient knee. Orthop Trans. 1996; 20: 7.
29. Longenecker SL, Hughston JC. Long-term follow-up of isolated posterior cruciate injuries. Am J Sports Med. 1987; 15: 628.
30. Dejour H, Walch G, Peyrot J, Eberhard P. The natural history ofrupture of the posterior cruciate ligament. Fr J Orthop Surg. 1988; 74: 35–43.
31. Keller PM, Shelbourne KD, McCarroll JR, Rettig AC. Nonoperatively treated isolated posterior cruciate ligamentinjuries. Am J Sports Med. 1993; 21: 132–6.
32. Shino K, Horibe S, Nakata K, Maeda A, Hamada M, Nakamura N. Conservativetreatment of isolated injuries to the posterior cruciate ligamentin athletes. J Bone Joint Surg [Br]. 1995; 77: 895–900.
33. Boynton MD, Tietjens BR. Long-term followup of theuntreated isolated posterior cruciate ligament-deficient knee. AmJ Sports Med. 1996; 24: 306–10.
34. Shelbourne KD, Davis TJ, Patel DV. The natural history ofacute, isolated, non-operatively treated posterior cruciate ligamentinjuries. A prospective study. Am J Sports Med. 1999; 27: 276–83.
35. Iwamoto J, Takeda T, Suda Y, Otani T, Matsumoto H. Conservative treatmentof isolated posterior cruciate ligament injury in professionalbaseball players: a report of two cases. Knee. 2004; 11: 41–4.
36. Toritsuka Y, Horibe S, Hiro-Oka A, Mitsuoka T, Nakamura N. Conservativetreatment for rugby football players with an acute isolatedposterior cruciate ligament injury. Knee Surg Sports TraumatolArthrosc. 2004; 12: 110-4.
37. Shelbourne KD, Muthukaruppan Y. Subjective results ofnonoperatively treated, acute, isolated posterior cruciate ligamentinjuries. Arthroscopy. 2005; 21: 457–61.

38. Tegner Y, Lysholm J. Rating systems in the evaluation ofknee ligament injuries. Clin Orthop Relat Res. 1985; 198: 43–9.

39. Hefti F, Muller W, Jakob RP, Staubli HU. Evaluation of knee ligament injuries with the IKDC form. Knee Surg SportsTraumatol Arthrosc. 1993; 1: 226–34.

40. Lysholm J, Gillquist J. Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale.Am J Sports Med. 1982; 10: 150–4.

41. Odensten M, Lysholm J, Gillquist J. Long-term follow-upstudy of a distal iliotibial band transfer (DIT) for anterolateralknee instability. Clin Orthop Relat Res. 1983; 176: 129–35.

42. Daniel DM, Stone ML, Barnett P, Sachs R. Use of the quadriceps active test to diagnose posterior cruciate-ligamentdisruption and measure posterior laxity of the knee. J Bone JointSurg [Am]. 1988; 70: 386–91.

43. Jakob RP, Hassler H, Staeubli HU. Observations onrotatory instability of the lateral compartment of the knee. Experimental studies on the functional anatomy and pathomechanism of the true and reversed pivot shift sign. Acta OrthopScand Suppl. 1981; 191: 1–32.

44. Noyes FR, Barber-Westin SD, Grood ES. Newer conceptsin the treatment of posterior cruciate ligament ruptures. In: InsallJN, Scott WN (eds) Surgery of the knee, 3rd edn. ChurchillLivingstone, Philadelphia. 2001; pp 850–852.

45. MacGillivray JD, Shubin Stein BE, Park M, Allen AA, Wickiewicz TL, Warren RF. Comparisonof tibial inlay versus transtibial techniques for isolated posteriorcruciate ligament reconstruction: minimum 2-year follow-up. Arthroscopy. 2006; 22: 320–8.

46. Rosenberg TD, Paulos LE, Parker RD, Coward DB, Scott SM. The fortyfive-degree posteroanterior flexion weight-bearing radiograph ofthe knee. J Bone Joint Surg [Am]. 1988; 70: 1479–83.

47. Merchant AC, Mercer RL, Jacobsen RH, Cool CR. Roentgenographic analysis of patellofemoral congruence. J Bone JointSurg [Am]. 1974; 56: 1391–6.

48. Hughston JC, Norwood LA Jr. The posterolateral drawertest and external rotational recurvatum test for posterolateralrotatory instability of the knee. Clin Orthop Relat Res. 1980; 147: 82–7.

49. Rubinstein RA Jr, Shelbourne KD, McCarroll JR, VanMeter CD, Rettig AC. The accuracy of the clinical examination in the setting of posterior cruciate ligament injuries. Am J Sports Med. 1994; 22: 550–7.

50. Staubli HU, Jakob RP. Posterior instability of the kneenear extension. A clinical and stress radiographic analysis ofacute injuries of the posterior cruciate ligament. J Bone JointSurg [Br]. 1990; 72: 225–30.

51. Hewett TE, Noyes FR, Lee MD. Diagnosis of completeand partial posterior cruciate ligament ruptures. Stress radiography compared with KT-1000 arthrometer and posterior drawertesting. Am J Sports Med. 1997; 25: 648–55.

52. Geissler WB, Whipple TL. Intraarticular abnormalities inassociation with posterior cruciate ligament injuries. Am J SportsMed. 1993; 21: 846–9.

53. Hamada M, Shino K, Mitsuoka T, Toritsuka Y, Natsu-Ume T, Horibe S. Chondral injuryassociated with acute isolated posterior cruciate ligament injury. Arthroscopy. 2000; 16: 59–63.

54. Strobel MJ, Weiler A, Schulz MS, Russe K, Eichhorn HJ. Arthroscopicevaluation of articular cartilage lesions in posterior-cruciateligament-deficient knees. Arthroscopy. 2003; 19: 262–8.

55. Skyhar MJ, Warren RF, Ortiz GJ, Schwartz E, Otis JC. The effects ofsectioning of the posterior cruciate ligament and the posterolateral complex on the articular contact pressures within the knee. JBone Joint Surg [Am]. 1993; 75: 694–9.