Isolated PCL Avulsion from the Tibial Attachment: Residual Laxity and Function of the Knee after Screw Fixation

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Objective: *To identify the posterior laxity of the knee after PCL fixation and to correlate the findings with the functional outcomes using the standard evaluation systems.*
Material and Method: *Ten isolated PCL avulsions from tibial attachment were enrolled. The operation was done within 16 days after injury. Anatomical reduction and internal fixation with a screw of the avulsion fragment was done under direct vision and was confirmed by radiographs. The follow up evaluation was done at an average of 40 months after the indexed surgery.*
Results: *Injured-normal side laxity difference at an average of 2.4 mm was observed. According to IKDC knee ligament standard evaluation, two knees were graded normal and eight knees were graded nearly normal. The average Lysholm score was 91. Two knees were graded as an excellent outcome and 8 knees were graded good outcome.*
Conclusion: *Despite mild laxity in the injured knee, the functional outcomes after fixation of the PCL avulsion were good to excellent.*

Keyword: *Posterior cruciate ligament, PCL avulsion, Tibia attachment, Tibia fracture, Knee laxity, Knee function*

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The posterior cruciate ligament (PCL) is the main restraint against posterior translation of the tibia on the femur[1]. It also resists internal rotation of the tibia on the femur because it winds around the anterior cruciate ligament[2]. The PCL does not attach to the posterior tibial spine but rather to a fovea 1 cm below the tibial plateau[2]. The so-called "isolated" PCL avulsion from the tibia is not a common injury to the knee[3]. Anatomical reduction and fixation of the avulsed fragment with a screw is the treatment of choice for this injury. A mild degree of posterior laxity of the knee after such operation had been detected. At the time this study started, there was no report concerning the amount of posterior knee laxity correlating with the knee functions after treatment by this surgical procedure. If the laxity significantly affects the knee function, modification of the current treatment protocol may be necessary.

The purposes of this study were to evaluate the amount of the posterior knee laxity and the knee functional outcome after treatment with open reduction and internal fixation of the PCL avulsion with a screw.

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Material and Method

Consecutive cases of acute isolated PCL avulsion from the tibia that underwent open anatomical reduction and internal fixation with a screw at Lerdsin General Hospital between January 1997 to April 2002 were retrospectively reviewed (Fig. 1). The exclusion criteria were delayed treatment more than 3 weeks, follow-up less than 18 months, associated injury to the same knee, and patients who did not achieved anatomical reduction of the fragment.

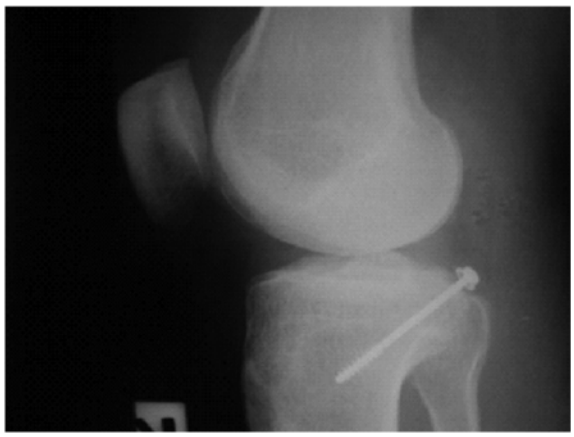


Fig. 1 Acute isolated PCL avulsion from tibia after open anatomical reduction and internal fixation with a screw

Twenty-one patients had PCL avulsion from the tibia. Six patients had associated medial collateral ligament injury, one patient had associated postero-lateral ligament complex injury, one patient underwent surgery 3 months after injury, and three patients had follow-up less than 18 months. Therefore, ten patients were enrolled in this study.

Anatomical reduction and internal fixation with a screw was done by one surgeon in all 10 patients. The operation was done within 16 days (average, 10 days) after injury. Radiographs of the knee had been taken immediately after operation. Each patient obtained measurements for posterior laxity and evaluation of the knee function at an average of 40 months (range, 22-58 months) after the indexed surgery.

Surgical technique and post-operative care

The patient was placed prone. A gently curved incision was made proximal to the flexion crease of the knee and curve to the medial aspect of the gastrocnemius muscle. An interval was bluntly developed between medial border of the gastrocnemius and the semimembranosus tendon, exposing the posterior joint capsule. A vertical incision was made through the posterior capsule to expose the tibial attachment of the posterior cruciate ligament. Blood clot was removed from the crater. The avulsed tibial attachment of the PCL was brought back to its anatomical position. The avulsed fragment was internally fixed with a 30-mm partially thread 4-mm cancellous screw. The screw did not purchase the far cortex. A spike washer might be needed if the avulsed fragment was small. The capsular incision was sutured. The gastrocnemius was allowed to settle into position. The subcutaneous layers were approximated. The skin was closed in a routine fashion.

The operated limb was immobilized in a long leg cast with the knee fully extended for 6 weeks. Non-weight bearing on crutches was allowed. Isometric quadriceps exercise in the cast was initiated immediately after surgery. At 6 weeks, the cast was removed and the patient was allowed to walk without crutches.

Measurement of the posterior laxity

KT1000 arthrometry measurement of the quadriceps active test described by Daniel et al[4] was done with the knee at 90 degrees flexion in both the injured and the normal knees. The mean of three measurements for each patient was reported.

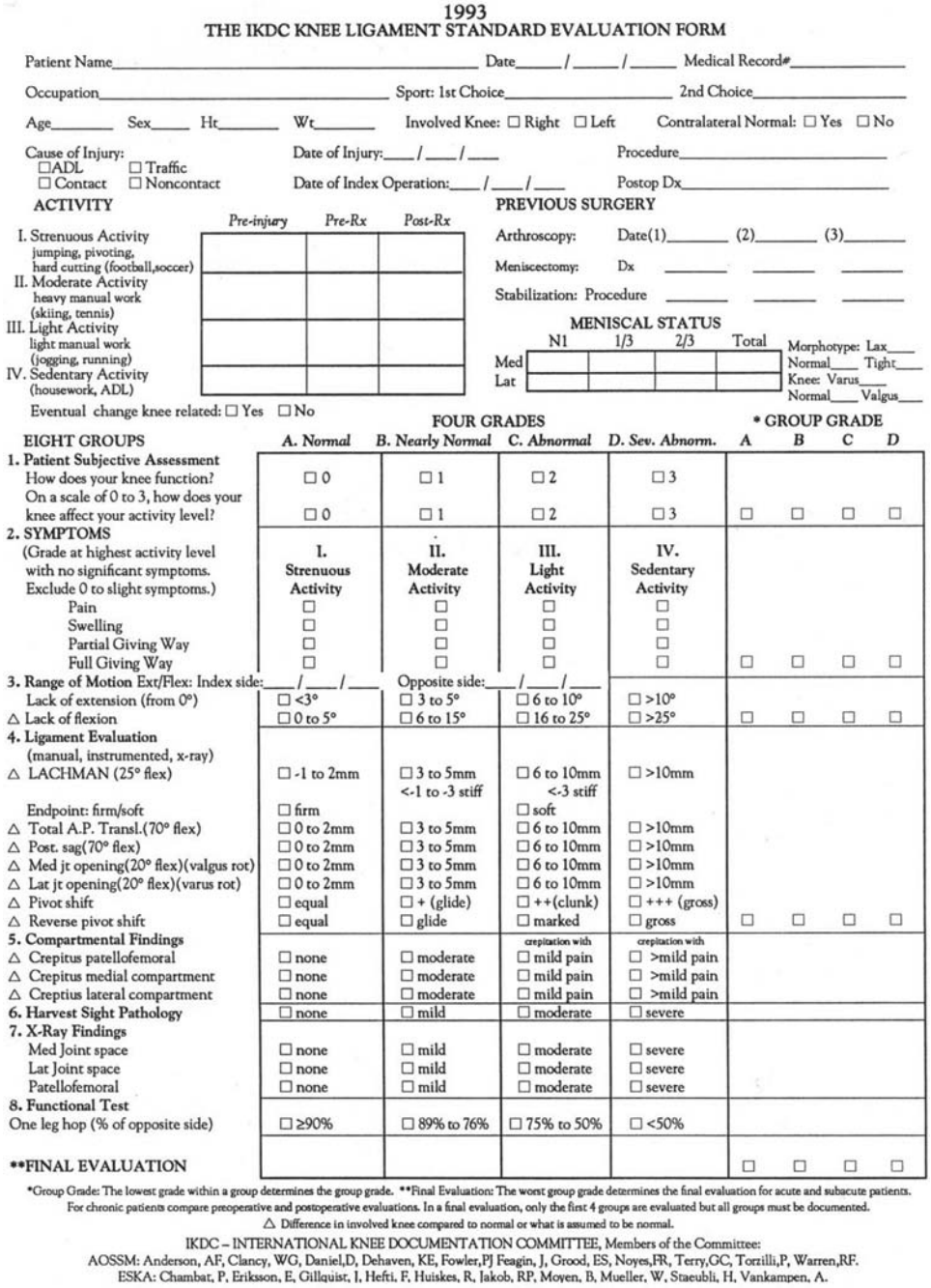
Evaluation of the knee function

The functions of the knees were evaluated after the fracture healed using two evaluating systems: the international knee documentation committee (IKDC) knee ligament standard evaluation form[5] (Fig. 2, 3) and Lysholm knee score[6] (Fig. 4). The IKDC standard knee evaluation form was published by Hefti et al in 1993[7] and revised in 1994[5]. It contains patient demography, activity, previous surgery, meniscal status, and eight groups of evaluation (patient subjective assessment, symptoms, range of motion, ligament examination, compartment findings, harvest sight pathology, x-ray findings, and functional test). Four functional grades were applied: A = normal, B = nearly normal, C = abnormal and D = severely abnormal. The Lysholm knee score is a condition-specific outcome measure that contains eight domains: limp, locking, pain, stair climbing, use of supports, instability, swelling, and squatting. An overall score of 0 to 100 points is calculated, with 95 to 100 points indicating an excellent outcome, 84 to 94 points, a good outcome, 65 to 83 points, a fair outcome, and < 65 points, a poor outcome.

Results

There were six males and four females. The mean age at injury was 30 years old (range, 15-43 years). There were eight motorcycle injuries and two dashboard injuries as shown in Table 1.

The mean injured-normal side laxity difference was 2.4 mm (range, 1-4 mm). Five of 10 knees had injured-normal side laxity difference of more than 2 mm. According to IKDC knee examination, two knees had normal knee function and eight knees had nearly



1993
THE IKDC KNEE LIGAMENT STANDARD EVALUATION FORM

Patient Name_____ Date____/____/____ Medical Record#_____

Occupation_____ Sport: 1st Choice_____ 2nd Choice_____

Age_____ Sex____ Ht_____ Wt_____ Involved Knee: ☐ Right ☐ Left Contralateral Normal: ☐ Yes ☐ No

Cause of Injury: ☐ADL ☐ Traffic ☐ Contact ☐ Noncontact
Date of Injury:____/____/____
Date of Index Operation:____/____/____
Procedure_____
Postop Dx_____

ACTIVITY

	Pre-injury	Pre-Rx	Post-Rx
I. Strenuous Activity jumping, pivoting, hard cutting (football,soccer)			
II. Moderate Activity heavy manual work (skiing, tennis)			
III. Light Activity light manual work (jogging, running)			
IV. Sedentary Activity (housework, ADL)			

Eventual change knee related: ☐ Yes ☐ No

PREVIOUS SURGERY
Arthroscopy: Date(1)_____ (2)_____ (3)_____
Meniscectomy: Dx _____ _____ _____
Stabilization: Procedure _____ _____ _____

MENISCAL STATUS

	N1	1/3	2/3	Total
Med				
Lat				

Morphotype: Lax____ Normal____ Tight____
Knee: Varus____ Normal____ Valgus____

EIGHT GROUPS	FOUR GRADES A. Normal	B. Nearly Normal	C. Abnormal	D. Sev. Abnorm.	* GROUP GRADE A	B	C	D
1. Patient Subjective Assessment								
How does your knee function?	☐ 0	☐ 1	☐ 2	☐ 3				
On a scale of 0 to 3, how does your knee affect your activity level?	☐ 0	☐ 1	☐ 2	☐ 3	☐	☐	☐	☐
2. SYMPTOMS (Grade at highest activity level with no significant symptoms. Exclude 0 to slight symptoms.)	I. Strenuous Activity	II. Moderate Activity	III. Light Activity	IV. Sedentary Activity				
Pain	☐	☐	☐	☐				
Swelling	☐	☐	☐	☐				
Partial Giving Way	☐	☐	☐	☐				
Full Giving Way	☐	☐	☐	☐	☐	☐	☐	☐
3. Range of Motion Ext/Flex: Index side:____/____/____		Opposite side:____/____/____						
Lack of extension (from 0°)	☐ <3°	☐ 3 to 5°	☐ 6 to 10°	☐ >10°				
△ Lack of flexion	☐ 0 to 5°	☐ 6 to 15°	☐ 16 to 25°	☐ >25°	☐	☐	☐	☐
4. Ligament Evaluation (manual, instrumented, x-ray)								
△ LACHMAN (25° flex)	☐ -1 to 2mm	☐ 3 to 5mm <-1 to -3 stiff	☐ 6 to 10mm <-3 stiff	☐ >10mm				
Endpoint: firm/soft	☐ firm		☐ soft					
△ Total A.P. Transl.(70° flex)	☐ 0 to 2mm	☐ 3 to 5mm	☐ 6 to 10mm	☐ >10mm				
△ Post. sag(70° flex)	☐ 0 to 2mm	☐ 3 to 5mm	☐ 6 to 10mm	☐ >10mm				
△ Med jt opening(20° flex)(valgus rot)	☐ 0 to 2mm	☐ 3 to 5mm	☐ 6 to 10mm	☐ >10mm				
△ Lat jt opening(20° flex)(varus rot)	☐ 0 to 2mm	☐ 3 to 5mm	☐ 6 to 10mm	☐ >10mm				
△ Pivot shift	☐ equal	☐ + (glide)	☐ ++(clunk)	☐ +++ (gross)				
△ Reverse pivot shift	☐ equal	☐ glide	☐ marked	☐ gross	☐	☐	☐	☐
5. Compartmental Findings			crepitation with	crepitation with				
△ Crepitus patellofemoral	☐ none	☐ moderate	☐ mild pain	☐ >mild pain				
△ Crepitus medial compartment	☐ none	☐ moderate	☐ mild pain	☐ >mild pain				
△ Creptius lateral compartment	☐ none	☐ moderate	☐ mild pain	☐ >mild pain				
6. Harvest Sight Pathology	☐ none	☐ mild	☐ moderate	☐ severe				
7. X-Ray Findings								
Med Joint space	☐ none	☐ mild	☐ moderate	☐ severe				
Lat Joint space	☐ none	☐ mild	☐ moderate	☐ severe				
Patellofemoral	☐ none	☐ mild	☐ moderate	☐ severe				
8. Functional Test One leg hop (% of opposite side)	☐ ≥90%	☐ 89% to 76%	☐ 75% to 50%	☐ <50%				
****FINAL EVALUATION**					☐	☐	☐	☐

*Group Grade: The lowest grade within a group determines the group grade. **Final Evaluation: The worst group grade determines the final evaluation for acute and subacute patients. For chronic patients compare preoperative and postoperative evaluations. In a final evaluation, only the first 4 groups are evaluated but all groups must be documented.
△ Difference in involved knee compared to normal or what is assumed to be normal.

IKDC – INTERNATIONAL KNEE DOCUMENTATION COMMITTEE, Members of the Committee:
AOSSM: Anderson, AF, Clancy, WG, Daniel,D, Dehaven, KE, Fowler,PJ Feagin, J, Grood, ES, Noyes,FR, Terry,GC, Torrilli,P, Warren,RF.
ESKA: Chambat, P, Eriksson, E, Gillquist, I, Hefti, F, Huiskes, R, Jakob, RP, Moyen, B, Mueller, W, Staeubli, H, Vankampen, A.

Fig. 2 The 1993 International Knee Documentation Committee Knee Ligament Standard Evaluation form

normal knee. There was no patient with abnormal or severely abnormal function. The mean Lysholm score was 91 (range, 85-100). Following Lysholm scoring system, two knees were graded excellent and eight knees were graded good.

Statistical analysis

The patients were divided into two groups according to the amount of the posterior displacement. Group 1 consisted of five patients with posterior laxity of 2 mm and less. Whereas, group 2 consisted of five

INSTRUCTIONS FOR THE IKDC FORM

The first part of the form establishes demographic information, history of prior surgery, findings of the index procedure, current status of the menisci (i.e., normal, 1/3 removed, 2/3 removed or complete removal), morphotype and knee alignment. For activity, the patient selects the highest activity level which he/she is able to perform; pre-injury, pre-treatment, and post treatment. This data is recorded but not graded.

The evaluation includes eight groups, each of which is assigned one of four grades. The eight groups are:

1. Patient Subjective Assessment:

How does your knee function? The patient is asked to rate the involved knee compared to the normal knee or what is perceived as normal.

2. Symptoms:

Grade at the highest activity level at which the patient thinks he/she would be able to function without significant symptoms, even if they were not actually performing activities at this level. Exclude 0 to slight symptoms. Performance at level I, strenuous activity, without symptoms is normal. Patients who are symptomatic at level I activity but not level II activities would be graded nearly normal.

3. Range of Motion:

Passive range of motion is recorded on the form for the index side and opposite or normal side. Record values for hyperextension/zero point/flexion, (e.g. 10 degrees of hyperextension, 150 degrees of flexion = 10/0/150). Hyperextension is recorded as a positive number and a flexion contracture as a negative number. Extension is graded from 0 degrees even if the patient has hyperextension of the normal knee.

4. Ligament Examination:

*The Lachman test, total AP translation at 70 degrees and medial and lateral joint opening may be assessed with manual, instrumented or stress x-ray examination. Only one should be graded, preferably a "measured displacement". A standard force of 30 lbs. (134N) is used in the instrumented examination. The numerical values for the side to side difference are rounded off, and the appropriate box is marked.

*The end point is assessed in the Lachman test. The end point affects the grading when the index knee has 3-5 mm. more anterior laxity than the normal knee. In this case, a soft end point results in an abnormal grade rather than a nearly normal grade.

*The 70 degree posterior sag is estimated by comparing the profile of the injured knee to the normal knee and palpating the femoral tibial stepoff. It may be confirmed by noting that contraction of the quadriceps pulls the tibia anteriorly.

The pivot shift and reverse pivot shift are performed with the patient supine, with the hip in 10-20 degrees of abduction and the tibia in neutral rotation using either the Losee, Noyes or Jakobs techniques. The greatest subluxation should be recorded.

5. Compartment Findings:

Patellofemoral crepitation is elicited by extension against slight resistance. Medial and lateral compartment crepitation is elicited by extending the knee from a flexed position with a varus and then a valgus stress (i.e., McMurray test). Grading is based on intensity and pain.

6. Harvest Sight Pathology:

Note tenderness, irritation or numbness at the autograft harvest site.

7. X-ray Findings:

A bilateral PA weightbearing roentgenogram at 35-45 degrees of flexion (tunnel view) is used to evaluate narrowing of the medial and lateral joint spaces. The Merchant view at 45 degrees is used to document patellofemoral narrowing. A mild grade indicates minimal changes (e.g., small osteophytes, slight scloerosis or flattening of the femoral condyle), but the joint space is wider than 4 mm. A moderate grade may have those changes and joint space narrowing (e.g., a joint space of 2-4 mm. wide). Severe changes include signicant joint space narrowing (e.g., a joint space of less than 2 mm).

8. Functional Test:

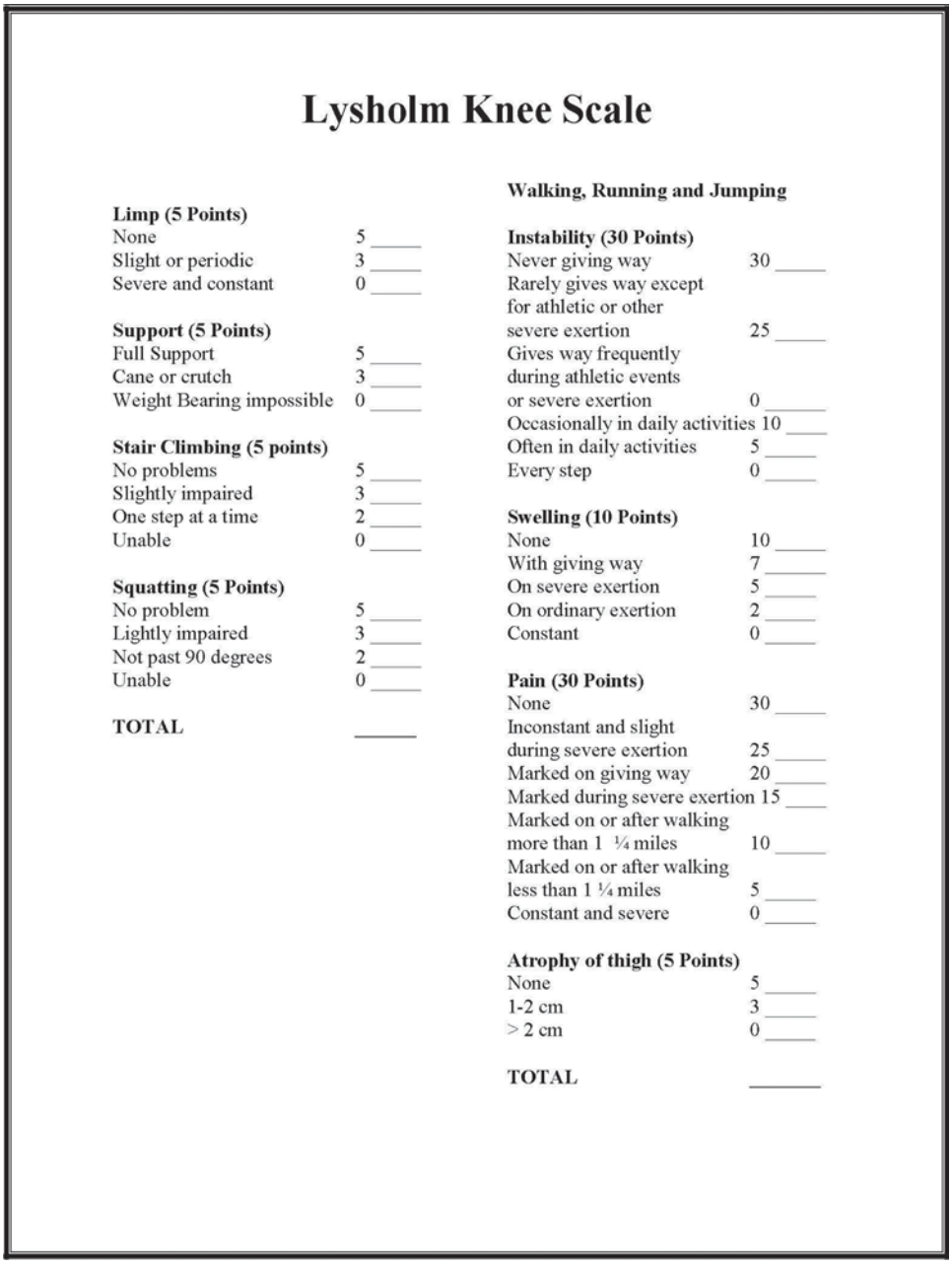
The patient is asked to perform a one leg hop for distance on the index and normal side. Three trials for each leg are recorded and averaged. A ratio of the index to normal knee is calculated.

Fig. 3 Instructions for using the form

patients with posterior displacement of more than 2 mm. Fisher exact test demonstrated that knee functions evaluated with both the IKDC standard knee evaluation and the Lysholm knee score were not statistically dependent with the amount of knee laxity ($p = 1.000$).

Discussion

Injury to the posterior cruciate ligament (PCL) is not common. Avulsion of the tibial attachment of the PCL is less frequent and found more often in the older age group[8]. The so-called "isolated" PCL is



Lysholm Knee Scale

Limp (5 Points)
None 5 _____
Slight or periodic 3 _____
Severe and constant 0 _____

Support (5 Points)
Full Support 5 _____
Cane or crutch 3 _____
Weight Bearing impossible 0 _____

Stair Climbing (5 points)
No problems 5 _____
Slightly impaired 3 _____
One step at a time 2 _____
Unable 0 _____

Squatting (5 Points)
No problem 5 _____
Lightly impaired 3 _____
Not past 90 degrees 2 _____
Unable 0 _____

TOTAL _____

Walking, Running and Jumping

Instability (30 Points)
Never giving way 30 _____
Rarely gives way except for athletic or other severe exertion 25 _____
Gives way frequently during athletic events or severe exertion 0 _____
Occasionally in daily activities 10 _____
Often in daily activities 5 _____
Every step 0 _____

Swelling (10 Points)
None 10 _____
With giving way 7 _____
On severe exertion 5 _____
On ordinary exertion 2 _____
Constant 0 _____

Pain (30 Points)
None 30 _____
Inconstant and slight during severe exertion 25 _____
Marked on giving way 20 _____
Marked during severe exertion 15 _____
Marked on or after walking more than 1 ¼ miles 10 _____
Marked on or after walking less than 1 ¼ miles 5 _____
Constant and severe 0 _____

Atrophy of thigh (5 Points)
None 5 _____
1-2 cm 3 _____
> 2 cm 0 _____

TOTAL _____

Fig. 4 Lysholm knee score

often overlooked. In these cases, the presence of ecchymosis and abrasions on the anterior surface of the proximal tibia are suggestive of this injury. Clinical examination confirms a posterior sag and a positive posterior drawer test[3]. One must always compare the injured knee with the opposite knee to avoid erroneous diagnosis of positive anterior drawer sign. Marked subluxation may be observed by viewing the profile of the knee, but if there is only slight posterior tibial subluxation or if there is swelling around the knee, the subluxation may not be appreciated. The quadriceps active test may be more useful to distinguish an anterior from a posterior laxity[4].

Table 1. Descriptive data: age, gender, cause of injury, time before surgery, time from surgery to knee evaluation, arthrometry, and functional score

Number	Age (years)	Gender	Cause of injury	Time before surgery (days)	Time from surgery to knee evaluation (months)	KT1000 arthrometry (mm)	IKDC Grade	Lysholm score
1	43	M	MCA	9	22	1	B	85
2	15	M	MCA	13	27	4	B	100
3	35	M	MCA	10	33	3	B	86
4	28	M	D	4	41	3	B	100
5	29	F	MCA	16	36	2	A	90
6	33	F	MCA	7	51	4	B	90
7	33	F	D	8	39	2	B	91
8	30	F	MCA	16	36	3	A	90
9	27	M	MCA	9	58	1	B	86
10	22	M	MCA	10	55	1	B	90
Mean (range)	30 (15-43)			10 (4-16)	40 (22-58)	2.4 (1-4)		91 (85-100)

F = female, M = male, MCA = motorcycle accident, D = dashboard injury, A = normal, B = nearly normal

Radiographs show a fragment of bone detached from the back of the intercondylar space of the tibial plateau. It may be only slightly displaced, or it may be pulled upwards and rotated. Although, surgical indications for midsubstance tear of PCL remains controversial, surgical fixation of the PCL avulsed fragment is the accepted treatment of choice in PCL avulsion fractures[9-11]. Conservative treatment, with even a small amount of distraction of the fracture components, commonly results in nonunion and may predispose to late functional instability of the knee[3,12,13]. If the fragment is large enough, screw fixation should be preferred to pulled-out suture or simple suture the fragment to the surrounding tissue[2,12]. Similar to other fractures, early fixation of the fragment yields better results.

In our cohort, the mean posterior knee displacement was found to be 2.4 mm at 90 degrees flexion. The cause of laxity after injury to the PCL has long been questioned. Associated meniscal injury might be one of the causes of knee laxity. At the time this study was performed, the magnetic resonance imaging and the arthroscopic examination were not routine and was very expensive. The patients did not receive such investigations. From the studies of Griffith et al[8], Inoue et al[14], Berg[15], and Zhao et al[16], MRI and arthroscopic examinations of the knees with avulsion of the tibial attachment of the PCL showed no patient with associated meniscal injury. A PCL injury usually occurs on an unloaded foot; therefore, the axial loads required to damage the meniscus are rarely present. Shelbourne et al[10] hypothesized that PCL laxity allows the tibia and the menisci to shift posteriorly, which puts the menisci in a non-weight bearing position and prevents meniscal tears.

From a pathomechanic study, the associated posterior capsule injury is less likely the cause of this posterior laxity[17]. The presence of the residual posterior laxity suggested that posterior cruciate ligament avulsion fracture should be address not only as a purely bone injury, but also as a bone-ligament injury. This idea cannot be supported by a MRI study of PCL avulsion patients[14]. In Inoue et al study[14], patients with or without occult midsubstance injury to the PCL at the beginning, which was detected by MRI, had no difference in residual posterior laxity after anatomical reduction and internal fixation of the avulsed fragment. We thought that at the time of injury, the PCL substance might be loaded until its property passed the yield point before the bone avulsed. Thus, the PCL had permanent plastic deformation. The changes of the property of the PCL cannot be detected by MRI. MRI findings of a healed PCL did not correlate with those of clinical or functional status[18]. MRI scans obtained by Tewes et al[18] within 10 weeks of injury showed that the clinically lax PCL was an intact continuous structure of homogenous low signal intensity, which is very different from the MRI appearance of the ACL. The ACL is usually ruptured and edematous when injured.

To reduce the posterior laxity, Berg[15] reported recession of the avulsed PCL fragment deep

into the tibial crater to make the ligament tighter in PCL avulsion injury patient. In that series, a case of motor vehicle accident with undetected PCL avulsion from the tibia received re-approximation of the fragment with a screw and spiked washer to a 2 mm recess made within the tibial PCL foot print four months after injury[15]. This patient had an excellent result 5 years after surgery. However, not all of the cases in the series showed good results. The other two patients came with knee pain and increase posterior knee laxity after injury. The MRI images showed intact PCL. The PCL recession procedures were done 5 months after injury. The laxity measurements improved in those patients; however, normal joint kinematics was not restored. If the knee function does not reach a certain level before interfering with a patient's activity, a recession procedure may not be needed.

All of the patients in this study had excellence and good knee functions despite subtle posterior laxity. No correlation between the knee laxity and the knee function could be statistically demonstrated. Piedade and Mischan[19] reported twenty out of twenty-one patients after surgical treatment of avulsion fracture of the PCL from tibial attachment had posterior laxity of at least 5-10 mm. It is surprising that even in the group of patients with more posterior knee laxity than this series, there were also excellent and good outcomes measured with the Lysholm score.

Conclusion

Despite mild laxity in the injured knee, the functional outcomes after fixation of the PCL avulsion were good to excellent. The recession of the avulsed fragment was not a necessary procedure for treatment of the isolated PCL avulsion.

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ความหลวมของข้อและประสิทธิภาพการใช้งานของข้อเข่าภายหลังการผ่าตัดตรึงกระดูกจุดเกาะเอ็นไขว้หลังของข้อเข่าที่แตกจากกระดูกทิเบียด้วยสกรู

ปริยุทธิ์ เจียรพัฒนาคม, เจริญชัย พากเพียรไพโรจน์, ประเสริฐ หลิ่วผลวณิชย์, ขรรค์ชัย มลังไพศรพณ์

วัตถุประสงค์: *เพื่อวัดความหลวมของเข่าที่มีจุดเกาะเอ็นไขว้หลังของข้อเข่าแตกจากกระดูกทิเบีย ภายหลังการผ่าตัดตรึงกระดูกด้วยสกรู โดยใช้เครื่อง arthrometer และศึกษาประสิทธิภาพการใช้งานของข้อเข่าดังกล่าวโดยใช้แบบประเมินเข่า IKDC knee ligament standard evaluation และ Lysholm score*

วัสดุและวิธีการ: *ศึกษาในผู้ป่วยโรงพยาบาลเลิดสิน 10 คนที่มีจุดเกาะเอ็นไขว้หลังของข้อเข่า แตกจากกระดูกทิเบียแต่เพียงอย่างเดียว โดยไม่มีการบาดเจ็บของเนื้อเยื่อส่วนอื่นของเข่า ผู้ป่วยเหล่านี้ได้รับการผ่าตัดภายใน 16 วันหลังจากบาดเจ็บ โดยการผ่าตัดยึดชิ้นกระดูกจุดเกาะเอ็นไขว้หลังด้วยสกรูกลับเข้าที่ตำแหน่งทางกายวิภาคเดิม ผู้ป่วยทุกคนจะได้รับการประเมินเข่าหลังการผ่าตัดโดยเฉลี่ย 40 เดือน*

ผลการศึกษา: *พบการเคลื่อนของกระดูกทิเบียไปทางด้านหลังได้ตั้งแต่ 1 ถึง 4 มิลลิเมตร มีค่าเฉลี่ย 2.4 มิลลิเมตร จากการวัดความหลวมโดยเครื่อง KT1000 arthrometer ประสิทธิภาพของเข่าวัดตามแบบประเมิน IKDC พบผู้ป่วย 2 คนจัดอยู่ในกลุ่มปกติ ผู้ป่วย 8 คนจัดอยู่ในกลุ่มใกล้เคียงปกติ เมื่อวัดประสิทธิภาพของเข่าวัดตามแบบประเมิน Lysholm พบว่าได้ค่าเฉลี่ย 91 ผู้ป่วยถูกจัดอยู่ในกลุ่มดีเยี่ยม 2 คน อยู่ในกลุ่มดี 8 คน*

สรุป: *แม้จะได้รับการผ่าตัดยึดชิ้นกระดูกจุดเกาะเอ็นไขว้หลังกลับสู่ตำแหน่งเดิม ยังพบมีความหลวมไปทางด้านหลังเล็กน้อยของข้อเข่าข้างนั้น แต่ประสิทธิภาพการใช้งานของข้อเข่าอยู่ในเกณฑ์ปกติหรือใกล้เคียงปกติ*