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Conservative treatment for rugby football players with an acute isolated posterior cruciate ligament injury

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Abstract We investigated the outcome of the conservative treatment from the point of athletic performance for rugby football players with an acute isolated PCL injury. The subjects were sixteen competitive rugby football players, with an average age of 21 years. After exercise consisting of quadriceps muscle strengthening and range of knee motion, the players were allowed to return to sports activity when swelling and pain disappeared. At one year after the injury, the period of return to pre-injury level and the self-evaluation for eleven performances during rugby football were surveyed by a questionnaire. Each performance of the athletic skills was rated as normal, nearly normal, abnormal or severely abnormal. Fourteen players

(88%) returned to their pre-injury level. The time to return to pre-injury level ranged from one to seven months, with a mean of three months. High-speed running was the most affected skill (9 out of 14, 64%). These results showed that performance of athletic skills was apparently affected in rugby football players with an acute isolated PCL injury though the conservative treatment was effective.

Keywords PCL · Rugby · Conservative treatment

Introduction

Posterior cruciate ligament (PCL) disruption is a well-known injury that occurs during collision sports like rugby football [1]. As several authors have reported that PCL disruptions respond well to conservative treatment in isolated cases [5, 6, 8, 9, 10, 12, 13], it is considered to be an effective treatment for rugby football players, though it requires high levels of performance of sporting activities. However, outcomes of conservative treatment for this injury remain unclear from the athletic aspect, that is, the time taken to return to competitive level or quality of athletic performance during competition. There was a shortage of information caused by the fact that previous studies included patients with varying sporting events and levels

of activities [5, 6, 8] and that in addition, these reported outcomes have been simply evaluated by overall functional rating or change in intensity of sporting activity [4, 8]. Thus, the purposes of this study were to prospectively elucidate the return to competitive level of athletes, focusing on rugby football players, and to clarify in a detailed evaluation how specific athletic skills were affected after the conservative treatment.

Patients and methods

Patient profiles are summarized in Table 1. The subjects of this study were sixteen competitive rugby football players who visited our hospital within four weeks after an isolated PCL disruption. All of them were male, ten forwards and six backs. Age at the time of injury ranged from 17 to 32 years (average 21) and the mean

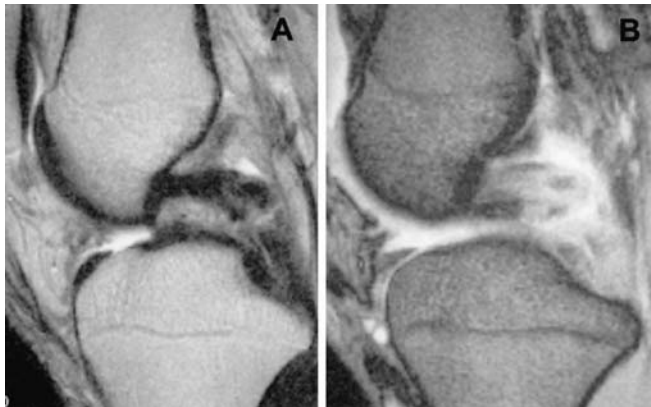


Fig. 1A,B MRI obtained one week after a PCL injury. **A** T1-weighted image. **B** T2-weighted image

time period from injury to presentation at our hospital was ten days (range 1 to 28). PCL disruption without any other ligamentous injuries was diagnosed by manual instability tests and MRI findings. A gravity sag view was taken to evaluate posterior instability. This allowed quantification of posterior sagging by calculating the side-to-side difference in shift of the tibia against the femur [11]. The average side-to-side difference of posterior sagging was 6.1 mm (range 2 mm to 11 mm). In order to confirm a complete tear of the PCL and to exclude other ligament and meniscal tears, MRI was taken in all patients. MRI findings showed an increased signal intensity of the PCL in T2 weighted images in all cases (Fig. 1). Although bone bruises were observed in four players, neither combined ligament injuries nor meniscal tears were present. (Table 1)

All patients were treated conservatively. The treatment regimen was as follows. The knee joint was not immobilized and range of motion exercises and muscle strengthening around the knee were immediately started with anti-inflammatory drugs. Full weight bearing was permitted as tolerated. The patients were allowed to return to sports activity when swelling and pain disappeared. Arthroscopic examination was performed for patients who could not return to competition or who made a delayed return due to pain or swelling.

For those players who returned to rugby football, a questionnaire was performed at one year after the injury. We gathered information regarding the amount of time it took to return to competition after the injury. Also, patients who were able to return to competition were asked to evaluate their performances in certain athletic skills. The number of skills for self-evaluation was eleven for forward players and ten for back players (Table 2). Eight basic skills (high-speed running, turning, side stepping, picking up the

ball, maul, receiving tackle, tackling and kicking) were questioned for all of the players. Three additional position-specific skills (scrummage, jumping in the line out, landing in the line out) for forward players and two additional skills (catching the punt, punt return) for back players were also evaluated. Each performance of the athletic skills was rated as normal, nearly normal, abnormal or severely abnormal. Players were asked to provide specific reasons for responses that were not normal.

Results

Fourteen patients (88%) were able to resume training within two months after injury, but two patients could not return to competition level due to pain and instability respectively. Although all the patients complained of pain and instability in the early phase of rehabilitation, these symptoms gradually diminished with time.

The time to return to a pre-injury level ranged from one to seven months with a mean of three months, excluding three patients with a delayed return due to other reasons such as graduation or work. Four players required over three months to return to a pre-injury level. Two of these patients reported instability, one reported pain, and the last listed other reasons. Arthroscopic examination was performed in three patients and revealed a severe chondral lesion in two patients complaining of pain (Table 1).

Regarding self-evaluations of performance of athletic skills, four players evaluated themselves as normal in all skills. Although no one reported ratings of 'severely abnormal' in any area of performance, the remaining ten players felt "not normal" in some areas of performance in their athletic skills. The self-evaluations of each performance are summarized in Table 1. High speed running was the most affected skill in PCL deficient knees (9/14, 64%). Evaluations and reasons for ratings of 'nearly normal' or 'abnormal' are shown in Table 3. The players complained of delay of motion, decrease of power and speed, or fear of re-injury in performing those skills, etc.

Discussion

In acute isolated PCL injuries, Parolie reported that the rate of return to a pre-injury activity level was 100% with early range of motion exercises and vigorous rehabilitation [8]. In our series, however, two (12%) could not return to their previous competition levels. This discrepancy may be due to differences in the types of sports participation and pre-injury activity levels.

The time to return to the previous competitive level was widely varied. This was due to the severity and/or duration of symptoms after injury. As our previous study reported [7], articular cartilage damage may be an important factor influencing post-injury sports activity. In this series, the two patients with chondral lesions gave up rugby football or delayed returning to a competitive level due to pain. This suggests that the presence of intra-articular dam-

Table 2 Athletic skills for self evaluation

Basic skills	Position specific skills	
	Forwards	Backs
High-speed running	Scrummage	Catching the punt
Turning	Jumping in the line out	Punt returning
Side stepping	Landing in the line out	
Picking up the ball		
Maul		
Tackling		
Receiving tackle		
Kicking		

Table 3 The reasons for rating the performance of athletic skills as nearly normal or abnormal

Athletic skills	Reasons	Number of players
High-speed running	Slow acceleration	6
	Feeling of delayed response	3
	Decrease of the speed	2
	Unclear	3
Turning	Feeling of delayed response	3
	Unclear	2
Side stepping	Slow stepping	1
	Feeling of delayed response	1
	Pain	1
Picking up the ball	Fear	2
	Pain in stooping down	1
Maul	Decrease of power	2
	Pain in extending the knee	1
Tackling	Can not catch up with the opponent	1
Receiving tackle	Fear	3
Kicking	Instability	1
Catching the punt		0
Punt returning	Delay of start	1
Scrummage	Decrease of power in pushing the scrummage	2
	Pain in collapsing	1
Jumping in the line out	Decrease of jumping height	3
Landing in the line out	Fear	1

Multiple answers were permitted

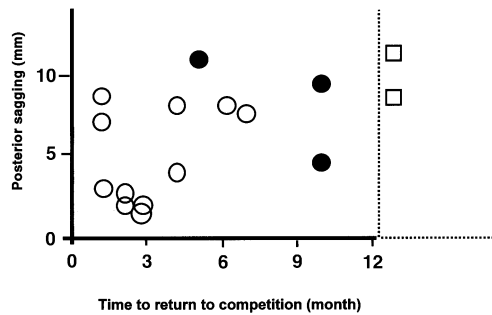


Fig. 2 The relationship between posterior sagging and time to return to a competitive level. An open circle shows a player who could return to a competitive level. A closed circle shows a player who made a delayed return due to non-medical reasons. An open square shows a player who could not return to a competitive level with this conservative treatment

age at the time of PCL injuries should be considered when predicting the time to return to previous activity levels.

As for the severity of posterior laxity, in this series patients with a grade I laxity tended to make earlier returns than those with greater laxity. The relationship between posterior sagging and time to return to a competitive level is plotted in Fig. 2. The severity of posterior laxity after injury might affect the returning time to a competitive level, though Shelbourne reported that the degree of laxity did not correlate with return to sports [9].

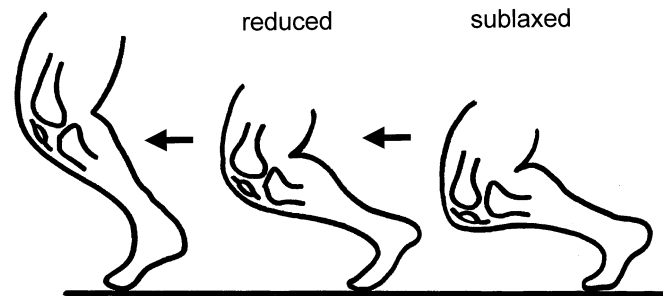


Fig. 3 Schema of knee extension in players with a PCL injury

Despite the high return rate after an isolated PCL injury in rugby football players, performance of athletic skills was apparently affected. The affected skills were as follows: high-speed running, turning, side stepping, tackling, punt returning, maul, scrummage, jumping in the line out and kicking. In performing these skills, the subjects reported that they felt slow in acceleration, had delayed responses, delay in starting, decrease of jumping height, or decrease in power in pushing the scrummage, etc. Considering that the tibia is posteriorly subluxed at the knee flexion position in a PCL deficiency [2, 3], the subluxed tibia must be reduced prior to initiating knee extension (Fig. 3). Therefore it takes more time to extend a PCL deficient knee than the normal knee. This time lag during the performance of the above-mentioned skills, which require

quick knee extension from the flexed position, makes athletes feel that the knee is abnormal and affects their performance.

We have to admit that our study has some limitations when interpreting the results. As we focused on the rugby football players with an isolated PCL injury, we had a small number of series. However, we believe this was an advantage for studying the outcome of the treatment from the athletic aspect prospectively. This study consisted of subjective evaluation with a short follow-up period. However, as we studied the affected performance of athletic skills, we believe that this interview at one year after the

injury is appropriate for our purpose. In addition, one year is a critical term for self-evaluation of high-level athletic performance because they would quit or retire from competition for non-medical reasons such as graduation or work after a period of more than one year.

In conclusion, 88% of rugby football players with an acute isolated PCL injury returned to previous competition levels after conservative treatment. In spite of the high return rate, players felt "not normal" during rugby performances which require quick knee extension from a flexed position, such as high-speed running, turning, jumping in the line out, etc.,

References

1. Boynton MD, Tietjens BR (1996) Long-term follow up of the untreated isolated posterior cruciate ligament-deficient knee. *Am J Sports Med* 24: 306–310
2. Cain TE, Schwab GH (1981) Performance of an athlete with straight posterior knee instability. *Am J Sports Med* 9:203–208
3. Castle TH Jr, Noyes FR, Grood ES (1992) Posterior tibial subluxation of the posterior cruciate-deficient knee. *Clin Orthop* 284:193–202
4. Cross MJ, Powell JF (1984) Long-term followup of posterior cruciate ligament rupture: a study of 116 cases. *Am J Sports Med* 12:292–297
5. Dandy DJ, Pusey RJ (1982) The long-term results of unrepaired tears of the posterior cruciate ligament. *J Bone Joint Surg Br* 64:92–94
6. Fowler PJ, Messieh SS (1987) Isolated posterior cruciate ligament injuries in athletes. *Am J Sports Med* 15:553–557
7. Hamada M, Shino K, Mitsuoka T, Toritsuka Y, Natsu-Ume T, Horibe S (2000) Chondral injury associated with acute isolated posterior cruciate ligament injury. *Arthroscopy* 16:59–63
8. Parolie JM, Bergfeld JA (1986) Long-term results of nonoperative treatment of isolated posterior cruciate ligament injuries in the athlete. *Am J Sports Med* 14:35–38
9. Shelbourne KD, Davis TJ, Patel DV (1999) The natural history of acute, isolated, nonoperatively treated posterior cruciate ligament injuries. A prospective study. *Am J Sports Med* 27:276–283
10. Shino K, Horibe S, Nakata K, Maeda A, Hamada M, Nakamura N (1995) Conservative treatment of isolated injuries to the posterior cruciate ligament in athletes. *J Bone Joint Surg Br* 77: 895–900
11. Shino K, Mitsuoka T, Horibe S, Hamada M, Nakata K, Nakamura N (2000) The gravity sag view: a simple radiographic technique to show posterior laxity of the knee. *Arthroscopy* 16: 670–672
12. Torg JS, Barton TM, Pavlov H, Stine R (1989) Natural history of the posterior cruciate ligament-deficient knee. *Clin Orthop* 246:208–216
13. Trickey EL (1968) Rupture of the posterior cruciate ligament of the knee. *J Bone Joint Surg Br* 50:334–341