Factors Influencing the Treatment of Posterior Cruciate Ligament Injury

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The primary objective was to determine the factors which influence the requirement of surgical treatment of posterior cruciate ligament (PCL) injury. Ninety one PCL injured patients diagnosed in the "Sports Medicine Clinic", Maharaj Nakorn Chiang Mai Hospital from January 1998 to December 2000 were included in the present study. There were 63 males and 28 females with an average age of 29 years. All of the PCL-insufficient knees were initially treated by non-operative method including 3 phases of rehabilitation. They were followed through to the end of December 2003. Analysis showed that the degree of posterior laxity was the only factor that had a statistical significant correlation to failure of conservative treatment. In addition, the need for surgical treatment was not associated with gender, age, cause of injury, and concomitant of injury. The authors concluded that PCL injured patients with posterior laxity greater than 10 millimeters should be treated by PCL reconstruction.

Keywords: *Treatment, Posterior cruciate ligament, Injury*

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Posterior cruciate ligament (PCL) injury is the second common serious knee ligament injury, with a varied incidence between 1% and 44%[1-5]. Most patients can be treated conservatively with satisfactory results[6]. However, some patients failed to get good results. Failure of conservative treatment was usually due to knee instability, pain, and degenerative arthritis of the knee from increased patello-femoral joint reaction force[7-10]. PCL reconstruction was done to solve these problems. The concepts and indications for performing the surgical treatments are, however, still obscure[11]. The present study was to find out the factors that influence failure of conservative treatment.

Objective

To identify the factors which lead to failure of conservative treatment, and indications for early reconstruction of PCL. Gender, age, mechanism of injury, associated injury, degree of posterior laxity, and failure of conservative treatment were analyzed.

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Material and Method

Ninety one PCL injured patients diagnosed in the "Sports Medicine Clinic", Maharaj Nakorn Chiang Mai Hospital from January 1998 to December 2000 were included in the present study. There were 63 males,and 28 females. Average age was 29 years. The highest cause of injury was motorcycle accident (76.7%). The second was car accident (7.8%). The injury was diagnosed by physical examination using the posterior drawer sign, which is the most sensitive and specific test for PCL injury[12]. All patients were treated first by the non-operative method for five months including analgesics, activity modification, and physical therapy. They were followed to the end of December 2003.

The objectives of applying physical therapy for patients with PCL injury were as follows:

1. To reduce swelling and the symptom of knee pain after the PCL injury.
2. To strengthening the quadriceps muscle.
3. To stimulate and increase the inception of propioceptive sense which the patients lose due to PCL injury.
4. To sustain the elasticity of muscles around the knee.

5. To let the patients know their condition so that they can adapt their daily life.

Physical therapy program

The course of physical therapy was composed of 3 phases which did not vary by grade of PCL injury (I, II, III). Phase I is the control of pain and swelling, phases II is the restoration of full ROM and normalization of ambulation and phased III is the return of the patients to normal activities of daily life and eventually sport activities.

Phase I. 1st to 4th week of the injury: Knee braces were applied to all patients and locked between 0 and 60 degrees for 1) protection of additional injury to the PCL and 2) to enhance the healing process. The knee Cryo/Cuff (AirCast, summit, New Jersey) was used to provide cold and compression with the objective of controlling swelling and inflammation and alleviating patients' pain. Additionally, the treatment enhanced prevention of further trauma to PCL as well as increasing the chance of PCL healing. This included strengthening of quadriceps muscles consistent with the functioning of the PCL to prevent posterior tibia translation as well as avoiding the activation of hamstring and calves muscles antagonistic to the functioning of the PCL.

Consistent with avoidance of this antagonistic stress, weight bearing was allowed only partially, up to 50% of body weight using ambulation aids. A stretching program for the posterior thigh and leg muscles was also provided to reduce tension to the injured PCL ligament; thus, hamstrings and gastrocnemius muscles were stretched, but only as tolerated without pain.

To improve dynamic stabilizers, quadriceps muscles were strengthened between knee flexion 0-60 degrees in progression with load as tolerated. Neuromuscular or proprioceptive training was applied at the late 4th week of the injury to increase stability of the knee joints. By the end of phase I, the patient usually had minimal swelling, 0-60 degrees of knee flexion, and abases quadriceps strength sufficient to allow good leg control during gait with 50% weight bearing.

Phase II. 4th- 12th week of the injury: Phase II of the rehabilitation program had the following goals: (1) maintain full knee extension, (2) increase flexion, (3) begin progressive strengthening with closed kinetic chain exercise, (4) maintain a minimal amount of swelling, (5) allow full weight bearing with normal gait, and (6) resume normal activities of daily living. During this phase patients increased the activities of daily living as long as they maintained full knee range of motion and weight bearing after the 8th week of injury. Quadriceps muscles were strengthened with increasing loads according to the ability of the patients to accomplish quadriceps-press. To enhance the stability of the knee, co-contraction of quadriceps and hamstrings muscles or closed kinetic chain exercise was applied as well as proprioceptive training. Full range of motion was improved by both active and passive exercise including closed kinetic chain exercise at the late 10th week of injury. Normal gait with full weight bearing was allowed during normal daily living with good leg control. Knee brace was still used to support the injured knee during performing light activities in the early phase II. The next addition to the rehabilitation, at the 12th week, was bicycle and swimming exercise with the objective of enhancing performance.

Phase III. 5th to 6th month after injury: The focus of phase III was on a functional return to the previous activity level including sport activities. At this point, the patients had full ROM, without pain. Mostly, minimal or no swelling had been presented and muscular strength was 80-90% range of the uninjured leg. Functional performance was emphasized by strengthening the muscles of the knee as follows: (1) Jogging straight forward, side by side, and backward direction, (2) performing advanced proprioceptive training such as one-leg standing on trampoline, (3) practicing sport specific skill training or agility drills, and (4) return to sport activities

If the conservative treatment for at least 6 months was unsuccessful, and the patients asked for surgical treatment, posterior cruciate ligament reconstructions were done[7,13-17,23]. The reconstructions were done by using central 1/3 of bone-patella tendon-bone auto graft from the ipsilateral knee, single bundle insertion to anatomical attachment of the femur, tibial inlay technique, and set the tension of fixation at 90 degrees knee flexion. No augmentation or secondary restrain reconstruction was done. Postoperatively, the same rehabilitation program was used.

Results

Sixty nine patients could be followed through to the end of the present study in December 2003. Analyzing the data to find correlation between types of treatment, gender, age, cause of the injury, con-

comitant injury, and degree of laxity to failure of non-operative treatment were done using EXCEL and SPSS.

There was no statistical significant correlation between age, gender, causes of the accident, and concomitant injuries to failure of non-operative treatment. The only factor which showed statistical significant difference was the degree of posterior laxity. The degree of laxity between 1+ and 2+ ($\leq$ 10 mm) showed no statistical significant difference between conservative and operative treatments. But for 3+ (>10 mm) laxity, surgical treatment was done significantly much more (p=0.012) as shown in Fig. 1.

Discussion

The natural history of posterior cruciate ligament injury is still unclear. Conservative treatment usually showed good results for isolated posterior cruciate ligament injury[5,11,18,19].

Torg et al 1989 demonstrated poorer results of treatment in PCL injury cases with concomitant ligament injury[19].

Dandy and Pusey[20] studied 20 cases of isolated posterior cruciate ligament injury and found that up to 14 cases had knee pain, 9 cases had giving way. With the 7 years period of follow up, there was no correlation between knee laxity and the result of the treatment.

Keller, et al 1993[21] studied 40 cases of isolated posterior cruciate ligament injury and found that 36 patients (90%) had pain while using that knee, 17 patients (43%) had some problems while walking, 18 patients (45%) had knee swelling. With 6 years follow up, it was found that knee problems increased with time and the roentgenogram also showed degenerative changes.

Shino et al 1995[22] report 22 cases of young athletes, every case was examined by arthroscopy and found that 4 cases had cartilage injury. All of them were advised not to play sports. Three cases had meniscus injury and were treated by meniscal repair. Fifteen cases had no cartilage and meniscus injury and were treated by conservative method. They were also allowed to play sports. After 51 months of follow up, 14 cases had no degenerative changes and could play sports well. They concluded that all isolated posterior cruciate ligament injury should be examined by arthroscopy. If there is no cartilage or meniscus injury the conservative treatment should be applied.

Dejoure, et al 1987[23] reported 45 cases. Forty cases (89%) had knee pain at an average 15 years after injury. After 25 years of follow up, most cases had degenerative changes in the medial tibiofemoral compartment.

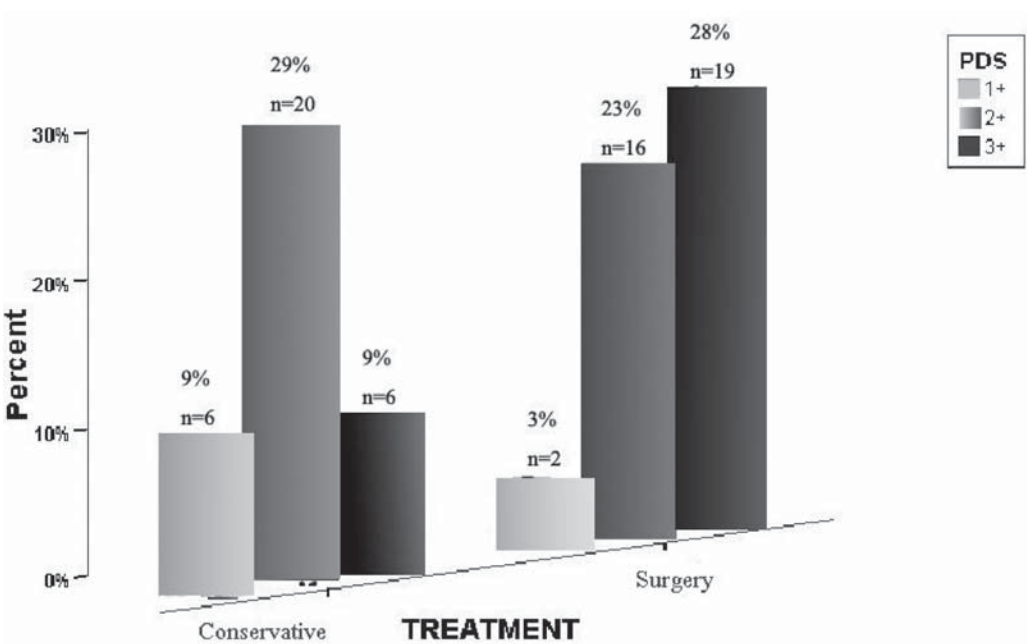

Fig. 1 Degree of posterior laxity and method of treatment For1+ and 2+ laxity, there was no statistical significant difference between conservative treatment and surgery For3+ laxity, surgical treatment was much higher (p=0.012)

The present study found that gender, age, cause of the accident, and concomitant injury were not the influential factors for failure of conservative treatment. The only factor which induced the presented patients to get surgical treatment was the severity of posterior laxity. For the laxity of 3+ (>10 mm), surgical treatment was used more than the conservative treatment with the statistical significant difference ($p = 0.012$).

Conclusion

For PCL injured patient, posterior laxity more than 10 millimeters (3+) is an indication for ligament reconstruction.

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ปัจจัยที่มีผลต่อการรักษาเอ็นเข่าไขว้หลังฉีก

กิตติมศักดิ์ อิทธิเวชช์, สัตยา โรจนเสถียร, สุรีย์พร พรมแพทย์

การศึกษาข้อมูลย้อนหลังของผู้ป่วยในคลินิกกีฬาเวชศาสตร์ ภาควิชาออร์โทปิดิกส์ ในปีพ.ศ.2541-2543 พบว่ามีผู้ป่วยเอ็นเข่าไขว้หลังฉีกจำนวน 100 ราย ผู้ป่วยทุกรายได้รับการรักษาเบื้องต้นโดยวิธีอนุรักษ์ โดยทำกายภาพบำบัด ผู้ป่วยจำนวน37รายมีผลการรักษาไม่ดี มีปัญหาในการใช้ชีวิตประจำวันหรือการออกกำลังกาย และจำเป็นต้องรับการผ่าตัดสร้างเอ็นเข่าไขว้หลังขึ้นใหม่

พบว่าปัจจัยที่มีอิทธิพลอย่างชัดเจนต่อความล้มเหลวของการรักษาโดยวิธีอนุรักษ์คือ ปริมาณความหลวมของข้อเข่ามากกว่า 10 มิลลิเมตร

สรุป: *ผู้ป่วยเอ็นเข่าไขว้หลังฉีก และตรวจพบว่าข้อเข่าหลวมมากกว่า 10 มิลลิเมตร ควรได้รับการรักษาโดยวิธีผ่าตัด*