CONSERVATIVE TREATMENT OF ISOLATED INJURIES TO THE POSTERIOR CRUCIATE LIGAMENT IN ATHLETES

KONSEI SHINO, SHUJI HORIBE, KEN NAKATA, AKIRA MAEDA, MASAYUKI HAMADA, NORIMASA NAKAMURA

From Osaka Rosai Hospital and Osaka University Medical School, Osaka, Japan

We assessed arthroscopically 22 young athletes with an isolated acute posterior cruciate ligament (PCL) injury. Four had significant damage to the articular cartilage of the medial femorotibial compartment and were advised not to resume sports. Three underwent PCL reconstruction because of a reparable meniscal tear or instability.

The other 15 were treated conservatively and resumed sport. At an average follow-up of 51 months, one had developed arthritic symptoms due to newly-developed severe chondral damage to the medial femoral condyle, but none of the other 14 had developed arthritic symptoms and most remained athletically active.

Severe chondral damage should be seen at an early arthroscopy. Knees with an isolated injury to the PCL with concomitant articular damage may be successfully managed by conservative treatment.

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Injury to the posterior cruciate ligament (PCL) is relatively common among athletes. It has been thought that isolated injuries of the PCL do well with conservative treatment and that degenerative joint disease will not develop secondary to the injury (Trickey 1968; Dandy and Pusey 1982; Fowler and Messieh 1987; Torg et al 1989). Clancy et al (1983) reported, however, that degenerative changes increase proportionately to the length of time after injury in the PCL-deficient knee. More recent papers have suggested that radiological evidence of degenerative changes gradually increases after the injury (Cross and Powell 1984; Parolie and Bergfeld 1986; Keller et al 1993).

One reason for the discrepancy of the findings in these studies is the uncertainty about the degree of cartilage damage at the time of injury to the PCL. The effectiveness of conservative treatment for the knee with an isolated PCL injury without concomitant cartilage damage has still not been clearly assessed. We therefore carried out arthroscopy on athletes who presented with a fresh isolated PCL injury to identify associated cartilage damage. A prospective follow-up was undertaken on those who were seen to have no, or only mild, damage to the articular cartilage.

PATIENTS AND METHODS

Injury had occurred within the previous three months in athletes of activity level I or II according to the IKDC knee ligament standard evaluation form (International Knee Documentation Committee 1992). They had a posterior sag sign of 2+ to 3+ and/or a posterior-drawer sign while awake or under anaesthesia, but did not demonstrate a positive anterior-drawer sign, a positive Lachman test, varus or valgus instability, excessive external tibial rotation compared with the contralateral normal knee, genu recurvatum or a pivot shift. Radiographs showed no bony lesion or osteoarthritic changes, with closure of the epiphyseal growth plate. The other knee had no history of injury and the clinical examination was normal. The affected knee had no previous injury.

During physical examination to evaluate posterior laxity, the posterior-sag and posterior-drawer signs were graded as 1+, 2+ or 3+. A 1+ grading was given for ≤5 mm of abnormal posterior displacement of the tibia with respect to the femur with the anterior border of the tibial plateau remaining anterior to the femoral condyles. A 2+ grading was for 5 to 10 mm of abnormal posterior displacement with the anterior border of the tibial plateau flush with the femoral condyles, and a 3+ grading was for abnormal posterior displacement of the tibial plateau of over 10 mm and posterior to the femoral condyles. These clinical gradings were calibrated by a lateral radiograph taken from the medial to the lateral direction with the patient supine, the
Arthroscopic the criteria knee view). A 896 medial (22 between knee knees) flexed it shows a 3+ grading with the anterior border of the tibial plateau posterior to the front of the femoral condyles.

knee flexed at 90° and the foot resting on the table top (gravity-sag view) (Fig. 1).

Between 1986 and 1991, 26 patients satisfied these criteria and were advised to undergo arthroscopic evaluation. Four, however, were not available for this procedure in the acute phase for social reasons, leaving 22 patients (22 knees) for inclusion in the study. Eighteen had injured the knee during sport while the other four had had motor-cycle accidents. There were 17 men and five women with a mean age of 21.7 years (16 to 44). The average time from injury to arthroscopic evaluation was 31 days (5 to 79). The mechanism of the injury was pretibial trauma on the ground or against the opponent in 15, hyperflexion in two, hyper-extension in one, a tackle from the lateral or medial direction in three and unknown in one. The left knee was involved in 12 patients and the right in 10. According to the IKDC knee ligament standard evaluation form, 15 patients performed at sporting level I and 7 at level II (Table I). Nine had been injured at rugby football and two in strenuous gymnastics.

Arthroscopic examination was performed under spinal or local anaesthesia through the anteromedial and anterolateral portals using a 4 mm arthroscope. The severity of cartilaginous injuries was graded from 0 to IV: grade 0, normal; grade I, superficial fibrillation or surface flaking; grade II, fissuring or fibrillation of less than half the thickness of the articular cartilage; grade III, fasciculation, fragmentation or degeneration greater than half the thickness of the articular cartilage; and grade IV, erosion to the subchondral bone.

RESULTS

The PCL was completely torn or severely attenuated over more than 70% of the ligament in all the patients; none had damage to the anterior cruciate ligament, the medial or lateral capsule, the popliteal tendon or the meniscofemoral ligaments. Two had a peripheral longitudinal tear in the anterior segment of the lateral meniscus. There were no other meniscal injuries. Three showed grade-I to grade-II damage to the lateral femorotibial articular surfaces but no injury to the menisci. Seven had lesions of the articular
surface of the medial compartment, grade I (one case), grade II (2), grade III (2) and grade IV (2). The severe lesions were predominantly found in the least convex portion of the medial femoral condyle which is the weight-bearing area when the knee is extended (Fig. 2), while one patient showed a grade-IV lesion on the anterior portion of the medial tibial plateau. Eight had superficial changes (grade I or II) on the patellofemoral articular surfaces.

After arthroscopy two patients who had a peripheral longitudinal tear in the anterior segment of the lateral meniscus were excluded because they were considered suitable for immediate operation for meniscal repair and PCL reconstruction (Fig. 3). A further four with grade-III and grade-IV injury to the medial femorotibial articular surface were also excluded and were persuaded not to return to preinjury levels of sport for fear that aggravation of the lesions would lead to early degenerative joint disease (Fig. 2). Another female patient who still had recurrent episodes of instability during activities of daily living after three months of rehabilitation, underwent PCL reconstruction. A male rugby football player was seen again one year after arthroscopy with persistent pain and swelling although he had not suffered further episodes of trauma. Further arthroscopy showed that a chondral lesion on the medial femoral condyle had progressed from grade II to grade IV (Fig. 4). He was advised not to participate in strenuous sports activities.

Thus, only 14 patients returned to their original level of sports activity and were available for follow-up of over 24 months. There were 11 men and three women with a mean age of 19.9 years (16 to 23). They were reassessed by a questionnaire about sports activity and subjective symptoms based on the IKDC knee ligament standard evaluation form. They had a physical examination and radiography which included the flexion weight-bearing view described by Rosenberg et al (1988), the skyline view and the gravity-sag view.

One male rugby football player was seen 25 months after arthroscopy with a complaint of injury to the contralateral left knee while playing the game. Arthroscopy showed a lateral meniscal tear and a grade-III injury of the anterior cruciate ligament. It was recommended that he retire from agility sports including rugby football, although his right knee showed neither arthritic symptoms nor functional instability.

The remaining 13 patients were seen with a mean follow-up of 51 months (24 to 96). Nine were available for personal examination and the other four had a telephone interview and were asked to reply to a questionnaire.

Eleven patients were still participating in sports at their preinjury level, seven at level I and four at level II. One female patient had reduced her activity from level II to level III because of instability. Social reasons rather than pain or instability had caused another female patient to reduce from level I to level III (Table I). None had arthritic symptoms such as swelling or persistent pain. Subjective evaluation based on the IKDC form rated three as normal, five as nearly normal, five as abnormal and none as severely abnormal. There was no worsening of symptoms in those with longer follow-up, and none had had subsequent operation.

None of the nine patients examined showed swelling, pain on patellar compression, joint-line tenderness, limitation of range of motion or meniscal signs. All had 2+ to 3+ posterior-drawer and sag signs while none had recurvatum, abnormal external tibial rotation or an abnormal adduction
<table>
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<tr>
<th>Case</th>
<th>Age at PCL injury (yr)</th>
<th>Sex</th>
<th>Side</th>
<th>Articular cartilage*</th>
<th>Meniscus</th>
<th>Follow-up (mth)</th>
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* PA = patellar articular surface; PG = patellar groove; LTP = lateral tibial plateau; MFC = medial femoral condyle; MTP = medial tibial plateau; LFC = lateral femoral condyle
† the measurement was performed in comparison with the reference position which was radiographed with the tibia reduced under manual anterior drawer of 50N
‡ grade of injury, see text
stress test. None had more than 1 cm wasting of the thigh muscles.

Radiography showed no osteoarthritic changes in eight patients while one had small marginal osteophytes on the medial tibial plateau and the lateral margin of the patella with normal joint spaces.

DISCUSSION

In this study four of the 22 knees with a fresh PCL injury but without other ligament damage also had severe damage to the articular cartilage of the medial femoritibial compartment. Subsequent abnormal loading of this abnormal cartilage because of PCL deficiency can reasonably be expected to accelerate these chondral changes leading to degenerative joint disease. Further athletic activity should therefore be discouraged.

Geissler and Whipple (1993) reported that chondral defects on the lateral femoral condyle were found in 12% of those with acute isolated PCL injury, but previous authors have also found that the severe damage to the articular cartilage is predominantly located in the medial femoritibial compartment (Clancy et al 1983). Recent cadaver studies confirmed this as they have shown an increase in contact pressure and pressure concentration on the medial side after the PCL had been cut (MacDonald et al 1993; Skyhar et al 1993). Also, since the medial femoral condyle is comparatively large and flat, it is more vulnerable at the time of injury from the anterior side with the knee flexed. This is because the posteriorly subluxed proximal tibial plateau cannot protect the femoral condyles against a blow from the anterior aspect due to the PCL insufficiency. Varus alignment at the knee may be another factor but no patient in this series had varus alignment beyond 183° of the femorotibial angle.

Lateral meniscal tears were present in 9% of our patients. Geissler and Whipple (1993) reported an incidence of 18% of lateral and 9% of medial meniscal tears but both studies show that the lateral menisci are more prone to injury than the medial. The PCL is attached slightly laterally to the posterior border of the tibial plateau and therefore a PCL tear may produce posterolateral as well as purely posterior subluxation giving a longitudinal tear of the lateral meniscus.

We found that most of the patients with PCL injury without severe cartilaginous lesions but with residual posterior laxity of 2+ to 3+ were able to perform well at sport for a mean of 51 months. Most were participating in strenuous activities at level I or II. These findings closely correspond to those reported by Fowler and Messieh (1987) who followed 13 patients with an isolated PCL injury for 2.6 years. Their patients, however, had posterior-drawer signs of trace to 1+, while our patients had posterior-drawer or sag signs of 2+ to 3+ at follow-up. Posterior laxity of 2+ to 3+ appears to be well tolerated by highly-active athletes if they do not have concomitant severe articular cartilage damage.

Conservative management should be the first choice of treatment for patients with an isolated PCL injury since the level of functional disability rather than the objective instability should be the principal factor in assessment. It should also be used, together with reduction in activity, in patients with associated grade-III and grade-IV articular damage.

Keller et al (1993) have reviewed isolated PCL injuries treated conservatively and suggest that the longer the interval between injury and follow-up, the greater the degenerative changes as seen radiographically. In their series, 65% of their patients were limited in their activity, 90% complained of knee pain during activity, 43% complained of problems while walking and 45% showed swelling. Instability itself seldom causes effusion or swelling and those who complained of swelling had probably sustained cartilage injury or meniscal tears. Arthroscopy had not been carried out and the presence of such lesions was unknown. Our initial arthroscopic evaluation and follow-up study suggest that seven of our patients (32%), four with severe or grade-III to grade-IV articular cartilaginous injury to the medial compartment, two with a longitudinal tear of the lateral meniscus and one with an initial grade-II lesion on the medial femoral condyle which later progressed to grade IV, would have a poor prognosis if treated non-operatively without reduction in activity.

It is uncertain which patients with isolated PCL injury should undergo reconstruction in the early period after injury. We feel that athletically active young patients with a grade-II injury to the articular surface of the medial femoral condyle (Fig. 5) or those with a reparable longitudinal tear of the meniscus should have an early stabilisation. A cadaver study by MacDonald et al (1993) indicates that young active patients with a varus-aligned knee without cartilaginous injury or meniscal tears should undergo early PCL repair.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

REFERENCES


