THE NATURAL HISTORY OF ANTERIOR CRUCIATE LIGAMENT INJURIES

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INTRODUCTION

The anterior cruciate ligament is an important structure in the knee. When damaged the knee can be shown by clinical testing to be mechanically unstable. The extent to which functional derangement and disability would result is still controversial. Allman calls the rupture of the anterior cruciate ligament "the beginning of the end of the knee"; others are more optimistic. McDaniel and Demoron reported that most of the patients were able to continue in their pre-injury sports (1,2).

We undertook a study of cases of untreated anterior cruciate ligament injury seen at the University Department of Orthopaedic Surgery, Singapore General Hospital to determine the sequelae.

MATERIALS AND METHODS

One hundred and forty one patients with untreated anterior cruciate ligament injury as their predominant injury were seen at the University Department of Orthopaedic Surgery, Singapore General Hospital in the period 1972 to 1984. 87 of these patients with 97 involved knees were available for study and a final review. All of these patients had objective evidence of anterior cruciate instability. 73 had an arthroscopy and an athrotomy to confirm the diagnosis. These patients had no surgical stabilisation undertaken.

There was a male preponderance with 85 males (92 knees) and 5 females (5 knees). The mean age at injury was 23 years with a range of 12 to 46 years. Fifty two of the knee injuries were sustained during football, 20 in other sports and the rest in other ways. The mean period of follow-up was 6 years with a follow up duration ranging from 2 to 11 years. The functional status after recovery from the injury was noted and reviewed again at the final assessment. The incidence of meniscectomy was also noted.

A radiological review of patients with more than 5 years follow-up was also conducted at final review using antero-posterior weight-bearing, lateral and intercondylar films. The radiological deterioration was based on a scoring and grading system designed by Satku, Kumar and Ngoi (3).

RESULTS

Functional Status

The functional disability of the involved knee increases with time. Five (6%) had to make adjustments to continue with daily living activities after recovery from the initial injury. 27 (31%) recovered sufficiently to continue with activities of daily living and 55 (63%) were able to continue their pre-injury sports. However, after a mean intervals of 6 years following injury, only 40 (46%) were able to engage in pre-injury sports. (Table 1)

TABLE I
DETERIORATION OF FUNCTIONAL STATUS IN ANTERIOR CRUCIATE LIGAMENT INJURY

Functional Status	No of Patients	
	Following Initial Recovery	Final Review at mean interval of 6 years
Coping with daily activities only	32 (37%)	47 (54%)
Coping with pre-injury sports/recreation	55 (63%)	40 (46%)
TOTAL	87 (100%)	87 (100%)

Meniscectomy

56 (58%) knees had meniscectomy performed. Of 38 knees with less than 5 yeas since injury, 16 (42%) had meniscectomy. Of 59 knees that had an interval of more than 5 years since injury 40 (68%) had lost at least one meniscus. It was not uncommon to see multiple tears in the meniscus when meniscectomy was performed a few years after the initial injury.

Radiological Assessment

Fifty nine knees had a follow-up period of more than 5 years. Forty four cases were available for final review and they were divided into two categories, those with meniscectomy done and those without meniscectomy and no clinical evidence of meniscal injury were assessed radiologically.

The radiological deterioration was more apparent in patients who had meniscectomy. Following meniscectomy only one knee remained unchanged. 20 knees showed mild changes, 13 moderate and one severe. When there was no meniscectomy and the patient had no clinical evidence of meniscus injury 8 of the 9 knees were normal and the other showed mild changes. (Table II)

TABLE II
RADIOLOGICAL DETERIORATION AT MORE THAN 5 YEARS INTERVAL AFTER ANTERIOR CRUCIATE LIGAMENT INJURY

Radiological Grading	Following Meniscectomy	No meniscectomy
		No Clinical Evidence of meniscal injury
Normal	1 (3%)	8 (89%)
Mild	20 (57%)	1 (11%)
Moderate	13 (37%)	0 (0%)
Severe	1 (3%)	0 (0%)
TOTAL	35 (100%)	9

DISCUSSION

Anterior cruciate ligament injuries are common especially among the young and athletic who are engaged in active and strenuous sports. Following this injury, haemarthrosis is invariably present. De Haven (4) using arthroscopic examination noted that 70% of knees with haemarthrosis and without any obvious injury have an anterior cruciate ligament injury. The bleeding occurs as a result of concomitant tears of the blood vessels within the ligament. It is therefore important to have a high index of suspicion whenever acute traumatic haemarthrosis is seen.

Objective clinical signs of knee instability following anterior cruciate ligament tear can be demonstrated using the Lachman, pivot shift or anterior drawer tests (5,6,7). Usually at least one of these signs is present.

Arthroscopy as an aid in the diagnosis of this condition is extremely useful as it also enables us to visualize other associated injuries especially meniscal tears.

Instability of the knee following anterior cruciate ligament tears resulted in significant functional disability initially in only 37% of our cases. This disability, however, is influenced by various factors such as severity of the injury, associated ligament injury, patient motivation and rehabilitative measures. However at final review at a mean interval of 6 years the figure increased to 54% indicating deterioration. It is most likely that persistent involvement in strenuous activities resulted in weakening of secondary supporting structures. Our review supports similar observations made by Noyes & Kennedy et al (6,7). Noyes (1983) reported that 83% of his patients in a selected population of athletes had initially returned to sporting activities but after 5 years only 35% were still participating in strenuous sports (5). The incidence of meniscal injury associated with anterior cruciate injury is high (4,7). In our series, 56 (58%) had lost one or both menisci. These meniscal injuries may occur at the initial injury or during episodes of giving way of the knee (6,7). This contributes to the deterioration.

The functional deterioration is also matched by radiological deterioration. This is worse in patients who had had meniscectomy done for 5 years and more with 97% showing mild to moderate deterioration. It appears that the absence of the meniscus in ACL insufficient knee contributes to the radiological deterioration seen. The loss of the meniscus increases the load per unit area of articular surface by almost 2 fold as the contact area is reduced (8). The resulting increased wear and tear following strenuous activities, contributes to the radiological deterioration.

It can thus be seen that the loss of the anterior cruciate ligament will lead to a deterioration in the knee both functionally as well as radiologically. This disability although affecting only a small proportion of individuals following initial recovery gradually affects an increasing number with time. The worsening is contributed by meniscal injury which may occur concomitantly at the time of injury or years later and by damage to secondary stabilisers of the knee.

REFERENCES

1. De Haven KE: Arthroscopy in the diagnosis and management of the anterior cruciate ligament deficient knee. Clin Orthop 1983; 172: 52-6.
2. McDaniel WJ Jr, Dameron TB Jr: Untreated ruptures of the anterior cruciate ligament: a follow-up study. J Bone Joint Surg (Am) 1980; 62-A: 696-705.
3. Satku K, Kumar VP, Ngoi SS: Anterior cruciate ligament injuries — To counsel or to operate. J Bone Joint Surg (Br) 1986; 68-B; 79.
4. De Haven KE: Diagnosis of acute knee injuries with haemarthrosis. Am J Sports Med 1980; 8: 9-14.
5. Torg JS, Conrad W, Kalan V: Clinical diagnosis of anterior cruciate ligament instability in the athlete. Am J Sports Med 1976; 4: 84-93.
6. Noyes FR, Mooar PA, Matthews DS, Butler DC: The symptomatic anterior cruciate-deficient knee. Part 1: the long-term functional disability in athletically active individuals. J Bone Joint Surg (Am) 1983; 65-A: 154-62.
7. Kennedy JC, Weinberg HW, Wilson AS: The anatomy and function of the anterior cruciate ligament: as determined by clinical and morphological studies. J Bone Joint Surg (Am) 1974; 56-A: 223-35.
8. Walker PS, Erkman MJ: The role of the menisci in force transmission across the knee. Clin Orthop 1975; 109: 184-92.