

Suture of the torn anterior cruciate ligament

5-year follow-up of 60 cases using an instrumental stability test

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60 patients were examined 5 (2–9) years after simple suture of acute rupture of the anterior cruciate ligament. In the follow-up the patients were examined clinically and by instrumental testing of stability (Acufex Knee Signature System). 10 knees had had a ligament reconstruction during the follow-up period, 28 knees were stable, and 22 unstable. By the Lysholm knee-score, function was rated excellent or good in both stable and unstable knees and the

Tegner activity score dropped insignificantly. A positive correlation was found between the measured laxities and the clinical tests. Instrumental stability testing seems to be a reliable supplementary tool in the diagnosis of anterior cruciate ligament insufficiency.

Ligament repair by simple suture was not better than reported results on conservative treatment.

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Only a few reports have been published on the method of Palmer (1938) for simple suture of a torn anterior cruciate ligament (Feagin and Curl 1976, Odensten et al. 1984, Kannus and Järvinen 1987, Clancy et al. 1988). Many surgeons feel that the technique gives poor long-term results.

We evaluated retrospectively the results of Palmer's method with special emphasis on the stability and function of the knee and the activity level of the patient.

Material and methods

Patients admitted to our department with acute tear of the anterior cruciate ligament in the period 1979–1987 were considered for the study. Patients with previous ligament injuries, concomitant fractures, or lesions of the posterior cruciate ligament were excluded from the follow-up. 68 patients, mean age 24 (15–53) years, met these requirements; 47 patients were men and 21 women. The treatment was simple repair of the ligament as described by Palmer (1938). All patients were operated on within 2 weeks of the injury. The average follow-up period was 5 (2–9) years. 8 patients were lost to the follow-up examination.

Before operation the patients underwent stability testing under general anesthesia. Most patients also underwent arthroscopy. Concomitant lesions were found in 31 knees, injury of the medial collateral liga-

ment being the most frequent. Isolated tears of the anterior cruciate ligament were present in nearly half of the patients. All concomitant lesions were repaired, when needed, in the same sitting, either by open technique or arthroscopically. The meniscal lesions were repaired when possible (Johannsen et al. 1988). No deep infections occurred. One patient had a superficial infection postoperatively, which was cured by antibiotics over a short period.

The lesion was located proximally in 58 cases, distally in 7 cases, and in midsubstance of the ligament in 3 cases. In 2 of the proximal lesions there was a small bony fragment present.

A plaster cast was used postoperatively for 6 weeks. No contact sports was allowed for 6 months.

In the follow-up examination, the 60 patients underwent clinical tests such as the Lachmann, the pivot shift, the anterior and posterior drawer test, and a test for frontal and rotatory stability. The instability was graded from zero to ++++. Furthermore, stability of the knee joint was evaluated by the Acufex Knee Signature System (KSS). The tests performed using the KSS were Lachmann at 20° of flexion, at 90° flexion, and the pivot shift. A special test was the active Lachmann test (Cross et al. 1987), for which the patient was asked to extend his knee from 30° to 0°. The anterior displacement of the tibia was then measured during the movement. Function was evaluated according to the Tegner (1985) scale and the Lysholm (1982) knee score.

Table 1. Distribution of positive Lachmann test versus the pivot shift test in the unstable knees (n 22)

Pivot shift	Lachmann	
	++	+++
0	4	1
+	6	3
++	5	1
+++	0	2

Acufex Knee Signature System (KSS)

The Acufex Knee Signature System is a computer-based, three-dimensional analytic tool for the assessment of tibiofemoral stability. The system consists of three transducers mounted on a tibial frame. The transducers record any tibiofemoral motion in three dimensions. A handle with transducers can be applied to simulate the drawer test and the Lachmann test. The degree of flexion and extension of the knee joint can be varied and the stability tested at any degree of flexion. Furthermore the system allows stability testing during active motion. The transducer signals are transmitted to a computer which provides a graphical display.

Results

10 patients underwent reconstructive surgery of the repaired ligament due to functional instability 2 (1-4) years after the primary operation. These 10 patients were not examined by the KSS, but were included in the unstable group as failures.

22 of the remaining 50 knees were clinically unstable at the time of the follow-up (Lachmann 2+ or 3+ and no firm end point). The majority of the knees regarded as unstable had a positive pivot shift test (Table 1). 28 knees were stable (Lachmann 0 or 1+ and negative pivot-shift). On the basis of these clinical findings the knees were designated unstable or stable.

Total antero-posterior laxity measured by the KSS was 15 ± 4.5 mm (160N) for unstable knees and 10 ± 3.3 mm (160N) for stable knees ($P < 0.001$). The anterior and posterior laxity measured in the contralateral, uninjured knees did not differ between the two groups of patients and posterior laxity was also the same.

The anterior displacement of the tibial plateau during extension (active Lachmann test) was 8.0 ± 3.8 mm and 4.4 ± 3.3 mm in unstable and stable knees, respectively.

A correlation was found between results from the Lachmann test, the pivot shift tests and the computerized measurements. The intraobserver variability of the KSS for the Lachmann tests was ± 10 percent.

The Lysholm knee score was 84 (62-100) in unstable knees and 91 (55-100) in stable knees (NS). The Tegner activity level dropped from 6.4 to 5.2 in unstable knees and from 7.0 to 5.1 in stable knees (NS). 23 patients resumed their former sports activities; 9/22 patients with unstable knees and 14/28 with stable knees.

Discussion

In experienced hands clinical stability tests seem reliable for the assessment of knee ligament injuries, but the need for a supplementary mechanical device for better measurements is obvious (Markolf et al. 1984). The reliability of mechanical testing for injuries to the anterior cruciate ligament has previously been demonstrated by Highenboten et al. (1989) and Andersson and Lipscomb (1989).

In our study a correlation was found between the Lachmann test and the mechanical test. The drawer test at 90° was not useful for revealing anterior laxity and is not recommended for testing in anterior cruciate ligament injury (Warren 1983). Assessment of knee stability by the KSS seems reliable and can be recommended as a supplement to the clinical examination, especially where objective measurements are required and needed for documentation.

The overall failure rate of primary simple repair was more than 50 percent. Nearly one fifth of the knees had a secondary reconstruction, which is in accordance with reports on closed treatment (Kannus and Järvinen 1987). However, the function seemed satisfactory and the activity level dropped only slightly. This corresponds very well with reports on non-surgically treated cases (Kennedy et al. 1974, McDaniel and Dameron 1980, 1983, Frank et al. 1982, Jokl et al. 1984, Kannus and Järvinen 1987).

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