THE NATURAL HISTORY OF THE MENISCUS IN ANTERIOR CRUCIATE INSUFFICIENCY

ARTHROSCOPIC ANALYSIS

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We studied arthroscopically the meniscal pathology in 100 patients with functional instability of the knee from isolated rupture of the anterior cruciate ligament at an average time of three years after injury.

Meniscal tears were observed in 86 patients and multiple lesions of both menisci were common. An incomplete longitudinal cleavage, visible on both surfaces of the posterior horn, was seen in more than half the knees and seemed to indicate progressive meniscal deterioration.

Clinical examination was unreliable and we suggest that arthroscopic assessment is necessary for accurate diagnosis and staging.

After disruption of the anterior cruciate ligament meniscal tears are common and patients often show functional deterioration with time (Noyes et al 1983; Satku, Kumar and Ngoi 1986). Paterson and Trickey (1983) suggested that meniscal tears may cause chronic instability to become worse and they showed that function may improve after meniscectomy. In the longer term, however, meniscectomy is thought to be a causative factor for degenerative arthritis (McDaniel and Dameron 1980; O'Brien et al 1989).

We assessed arthroscopically the meniscal tear patterns in patients with functional knee instability from disruption of the anterior cruciate ligament.

PATIENTS AND METHODS

During 1988 and 1989 we examined 100 consecutive patients with isolated rupture of the anterior cruciate ligament. There were 24 women and 76 men with a mean age of 29 years (12 to 50). In each case an interview, clinical examination, examination under anaesthesia and arthroscopic assessment were performed by the senior author (MMSG). Injury had occurred on average 36 months before consultation (0 to 240); only nine patients presented immediately after injury. Examination under anaesthesia showed a positive Lachman test in all and a positive pivot shift in 88. No patient had any other ligamentous instability.

RESULTS

In only 14 patients were both menisci intact. In the remaining 86 there were 127 tears. The plane of cleavage of the meniscus was almost always longitudinal and in the outer zone. The tears were classified as incomplete (29 patients) or of full-thickness (35); 22 patients showed

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<thead>
<tr>
<th>Table I. Location of 60 partial thickness tears on the superior or inferior surface of the posterior horn of the meniscus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medial</td>
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<tr>
<td>Superior</td>
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<td>Inferior</td>
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<tr>
<th>Table II. Characteristics of all 127 meniscal tears</th>
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<tr>
<td>Medial</td>
</tr>
<tr>
<td>Partial-thickness</td>
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<td>Full-thickness</td>
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<tr>
<td>Stable longitudinal</td>
</tr>
<tr>
<td>Bucket-handle</td>
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<tr>
<td>Flap</td>
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<td>Complex</td>
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Bar graph showing meniscal changes against time from injury in 78 patients.

Both types. The partial-thickness tears were confined to the posterior horn, most often on the undersurface of the lateral meniscus, and showed variable penetration (Table I). Full-thickness tears usually involved the medial meniscus and were of the bucket-handle type (Table II).

To study the temporal relationship between partial-thickness and full-thickness tears we excluded the 22 patients with both types from the study. The findings in the remaining 78 are shown in Figure 1. Wilcoxon U testing showed highly significant differences between the incidences of partial-thickness and full-thickness tears ($p = 0.008$). Analysis of variance confirmed a progression of pathology ($p = 0.016$); partial-thickness tears were seen earlier and occurred after a shorter interval than full-thickness tears (Fig. 2).

In most of the patients the clinical evidence of meniscal derangement was obscured by the instability, so that a 'clinical' diagnosis of meniscal pathology could be made in only 29 patients. Arthroscopy revealed no false-positive clinical results, but the clinical diagnosis was found to be fully accurate in only 15. Twelve had tears of both menisci and in two the meniscal tear was on the opposite side to that suspected clinically.

**DISCUSSION**

Reconstruction of the anterior cruciate ligament remains controversial but it is clear that meniscal preservation critically affects the long-term health of the knee after cruciate rupture (O'Brien et al 1989). We have studied the natural history of meniscal deterioration in an attempt to obtain new information and to provide a more objective basis for treatment.

Hart (1982) reviewed 142 patients with laxity of the anterior cruciate ligament and found meniscal tears in...
27% of those arthroscoped soon after injury compared with 90% of those with chronic instability. These are similar to our results and to those of other authors (McDaniel and Dameron 1980). We suggest that in some patients the menisci are torn at the time of the cruciate ligament injury but that in most the menisci undergo gradual attrition from abnormal loading and, particularly, increased shear. Our results show that although the type of pathology may differ, both menisci are equally vulnerable.

There is also a significant temporal separation of partial-thickness and full-thickness meniscal lesions. The incidence of major tears increases with time from the original injury. The greater number of major tears of the medial meniscus may reflect the fact that it is relatively immobile, being firmly attached to the tibial plateau; unlike the lateral meniscus, it acts as a restraint to anterior tibial translation in the cruciate-deficient knee (Levy, Torzilli and Warren 1982).

The earliest arthroscopic sign of secondary meniscal pathology was a longitudinal fissure in the outer zone, usually on the undersurface of the lateral meniscus. This is not unexpected since the principal mechanical effect of anterior cruciate insufficiency is increased roll-back of the femoral condyles, particularly of the lateral condyle at the beginning of flexion (Reuben et al 1989). This is also the basis of the pivot shift test. At first the meniscal fissure is seen only in the posterior horn, but as abnormal loading and movement of the knee continue, it tends to extend anteriorly and also through the substance of the meniscus to become a complete tear, which may eventually require meniscectomy.

Stabilisation of the knee may modify this progression, but no conclusions can be drawn from our study on whether ligament repair has a beneficial effect in reducing further meniscal damage. Bray and Dandy (1989) found that after reconstruction by MacIntosh lateral substitution, with or without intra-articular ligament replacement, fresh meniscal lesions were most common when a positive pivot shift recurred. Another argument for this relationship is that, in stable knees, longitudinal tears in the outer zone of the meniscus have an inherent tendency to heal (Weiss et al 1989).

Partial-thickness or stable full-thickness tears are intermediate and potentially reversible stages in the natural history of meniscal degeneration. Ligament reconstruction may prevent their deterioration into major meniscal tears. Furthermore, it may be possible to repair an unstable peripheral separation of the meniscus. Hanks et al (1989) suggested that cruciate deficiency increased the risk of failure very little after suture repair of peripheral meniscal tears. Our experience has been less encouraging and we advise against meniscal repair in the presence of ligamentous instability.

The inadequacy of clinical examination alone is clear. We have shown that even an experienced surgeon fails to diagnose meniscal tears in such cases in many more than the 5% error rate claimed by Smillie (1978). Arthroscopic assessment is necessary both for the diagnosis and the staging of meniscal damage.

We suggest that anterior cruciate reconstruction should be offered to patients with established tears in one or both posterior horns and a strongly positive Lachman or pivot shift test. This appears to be the only available means of protecting the meniscus from progressive damage, irrespective of the degree of symptomatic instability.

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REFERENCES


