Lateral meniscus lesions on stable knee:
A prospective multicenter study

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Summary
Introduction: The present prospective multicenter study sought to analyze immediate and short-term (6 months) course following lateral meniscus lesion surgery.

Material and methods: Between 2007 and 2008, 104 lateral meniscus lesions on stable knee were recruited prospectively in 10 centers. Lesion type and topography were recorded and patients were assessed by Knee Osteoarthritis Outcome Score (KOOS) and subjective and objective International Knee Documentation Committee (IKDC) scores, preoperatively and at 6 months' FU. Mean age was 37 years, with a large preponderance of male patients.

Results: Lesion topography, type and management were inventoried for all patients (n = 104). A majority of lesions were located in the mid-body segment. Conservative treatment (meniscal suture) was applied in a third of cases. Fifty-six patients (54%) could be analyzed at end of FU on the various assessment scores. At 6 months, patients had recovered their preoperative activity level on IKDC. Twenty-two percent, however, experienced persistent pain or reduced range of motion and 12% of postoperative courses were considered difficult.

Discussion: Lateral and medial meniscal lesions differ in topography, the latter occurring less often in the anterior segment. Only 30% of patients were able to resume light physical activity on the IKDC scale at 1 month: 6 months appear to be necessary for patients operated on for a lateral meniscal lesion to recover their preoperative level of activity.

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Introduction
Lateral meniscal lesions on stable knee are much rarer than medial meniscal lesions and have been little focused on in the literature. Lateral meniscus surgery, however, is notorious for its prolonged postoperative course and for disastrous complications such as rapid chondrolysis [1,2,3]. The adverse consequences of subtotal lateral meniscectomy have also been definitively demonstrated. This has led, over the last 10 years or so, to the introduction of lateral meniscus allografts. These constitute one of the few treatment options for incipient arthritis of the lateral femorotibial...
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Material and methods

The French Arthroscopy Society ran a continuous 1-year multicenter study of the lateral meniscus. There were two aims: firstly to conduct a topographic lesion analysis and, secondly to analyze the short-term results of surgical management.

Ten public and private sector hospitals (Caen, Geneva, Luxembourg, Lyon [2], Paris [3], Rennes, Toulouse and Versailles) were involved. All patients treated for lateral meniscus lesion on stable knee in 2007 and the first half of 2008 were prospectively included, with the exception of those presenting femorotibial osteoarthritis or pre-arthritis (grades C and D on the International Knee Documentation Committee [IKDC] classification).

The exclusion criteria were central pivot lesion and/or lateral femorotibial osteoarthritis. Clinical follow-up included subjective and objective IKDC scores [4] and Knee Osteoarthritis Outcome Score (KOOS) [5]. The following X-ray views were systematically taken to analyze osteoarthritis preoperatively and at end of follow-up: antero-posterior (AP) and lateral extension views under single-stance weight-bearing, lateral 30° flexion view under single-stance weight-bearing, axial 30° flexion view, goniometry and schuss view. One MRI scan was systematically performed, with coronal fat-saturated T1 and T2 weighted images and sagittal fat-saturated T2-weighted 2-echo and gradient-echo images. In certain centers, technetium 99 bone scan could also be performed, to explore hyperfixation in the affected knee with selective counting on both knees. Chondral lesions were graded preoperatively on the International Cartilage Repair Society (ICRS) scale. Meniscal lesion topography was recorded on Cooper’s schema [6] of three segments (anterior, mid-body and posterior) and four segments, from periphery to center (Fig. 1). Five types of lesion were distinguished: vertical (including bucket-handle and flap lesions), horizontal, radial, complex and meniscal cyst. The rehabilitation program was standardized, with complete resumption of sport allowed as of postoperative week 6.

One hundred and four patients (104 knees) were included: 35 female, 69 male (sex ratio: 2:1). Mean age was 37 ± 13 years (12–68 years). There were 61 right and 41 left knees. Mean body mass index (BMI) was 22.4 in females and 25.1 in males. Seventy-seven percent of patients were estimated to have intense or moderate activity. Trauma could be established in preoperative consultation in 55% of cases. Seventy-one percent of patients practiced sports, including 44% practicing pivot and contact sport. Initial consultation was mainly for pain (88%), but effusion was also found in 51% of cases, episodes of locking in 37% and flexion contracture in 23%. By virtue of the inclusion criteria, all lateral femorotibial compartments were considered healthy (i.e., grade A or, in 8% of cases, grade B). Peroperatively, chondral lesions were found in the femoropatellar compartment in 20% of cases, in the medial femorotibial compartment in 14% and in the lateral femorotibial compartment in 30%.

Statistical analysis, on StatView® (SAS), used Chi², ANOVA, ROC curves and targeted logistic regression, with the significance threshold set at $P < 0.05$.

Results

Lesions were principally located in the mid-body segment (see Table 1). Segment distribution by lesion type was homogeneous. Lesion depth was identical in all three segments, and mainly central (44.5%) or peripheral (43.5%). Ten percent showed menisco-synovial desinsertion. There was no significant correlation between lesion type and segment location (see Table 2).

Management was by meniscectomy in 67% of cases. One third of the meniscus was involved in 57% of meniscectomies and two thirds in 43%. Meniscectomy was in zone 2 in a majority of cases (54%) and for complex lesions (see Tables 3 and 4).

Meniscal capital was able to be conserved in 30% of cases: isolated suture was performed in 21% of cases and combined meniscectomy and suture in 10%, especially for complex (horizontal and vertical) lesions. Suture was performed mainly for vertical lesions (60%) and in zones 3 and 4 (83%). In two cases, surgery was abstained from.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Lesion location.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Anterior segment (%)</td>
</tr>
<tr>
<td>Zone a 1</td>
<td>0</td>
</tr>
<tr>
<td>Zone 2</td>
<td>12</td>
</tr>
<tr>
<td>Zone 3</td>
<td>13</td>
</tr>
<tr>
<td>Zone 4</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>29</td>
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</table>

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Table 2: Lesion distribution.

<table>
<thead>
<tr>
<th></th>
<th>Complex lesion (%)</th>
<th>Horizontal lesion (%)</th>
<th>Flap (%)</th>
<th>Radial lesion (%)</th>
<th>Vertical lesion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior segment</td>
<td>35</td>
<td>25</td>
<td>42</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Mid body</td>
<td>93.5</td>
<td>95</td>
<td>57</td>
<td>-</td>
<td>77.4</td>
</tr>
<tr>
<td>Posterior segment</td>
<td>71</td>
<td>25</td>
<td>35</td>
<td>0</td>
<td>90.3</td>
</tr>
<tr>
<td>Total</td>
<td>31.3</td>
<td>20.2</td>
<td>14</td>
<td>3</td>
<td>31.1</td>
</tr>
</tbody>
</table>

Table 3: Lesion distribution and treatment.

<table>
<thead>
<tr>
<th></th>
<th>Complex (%)</th>
<th>Horizontal (%)</th>
<th>Flap (%)</th>
<th>Radial (%)</th>
<th>Vertical (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meniscectomy</td>
<td>35</td>
<td>24</td>
<td>18</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Suture</td>
<td>14</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>81</td>
</tr>
</tbody>
</table>

Table 4: Lesion location and treatment.

<table>
<thead>
<tr>
<th></th>
<th>Anterior segment (n=29)</th>
<th>Mid-body segment (n=86)</th>
<th>Posterior segment (n=63)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Z1 Z2 Z3 Z4</td>
<td>Z1 Z2 Z3 Z4</td>
<td>Z1 Z2 Z3 Z4</td>
</tr>
<tr>
<td>Meniscectomy (%)</td>
<td>44 44 12 35 (N=25)</td>
<td>3 49 39 9 (n=4)</td>
<td>54 39 7 n=44</td>
</tr>
<tr>
<td>Suture (%)</td>
<td>50 50 14 (n=4)</td>
<td>7 13 80 5 (n=15)</td>
<td>82 18 n=17</td>
</tr>
</tbody>
</table>

There were 17 cases of associated meniscal cyst (see Fig. 2), always in the mid-body segment. There were significantly more horizontal lesions associated with meniscal cyst ($P=0.002$). Conservative treatment was applied in younger patients (mean age = 33 years) than was meniscectomy (mean age = 40 years; $P=0.02$). Postoperative course was judged difficult in 12% of cases, with two infections, three effusions requiring puncture, two traumatic patellar fractures and two cases of reflex sympathetic dystrophy. No predictive factors were found for these complications.

At end of follow-up, only 56 of the patients could be seen. Their KOOS and subjective IKDC scores had improved over 6 months’ follow-up (FU) (Figs. 3 and 4). The greatest increases in KOOS were on the sports and quality of life items. The subjective IKDC score (Fig. 4) improved significantly, by 11% at 1 month ($P=0.0001$) and by 21% between postoperative months 1 and 6 ($P=0.0001$). At 6 months’ FU, patients had recovered their pre-trauma activity levels (Fig. 5). Likewise, objective IKDC scores (n=56) improved over the 6 months (Fig. 4). Even so, at 6 months’ FU, 22% of patients still reported pain, despite clear alleviation. The 6-month X-rays (n=56) showed radiological aggravation in

Figure 2: Lateral meniscus cyst.

Figure 3: Preoperative and short-term Knee Osteoarthritis Outcome Scores (KOOS).
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Figure 4  Preoperative and short-term subjective International Knee Documentation Committee (IKDC) scores.

7% of cases, including 5% grade C. No rapid chondrolysis, however, was observed.

There was no significant difference in scores according to:

- gender;
- BMI;
- activity level;
- treatment option;
- difficulty of postoperative course;
- lesion type;
- resection volume.

The sole prognostic factor that emerged was age, with KOOS and IKDC scores falling off after the age of 40.

Discussion

Many series [7–9] in the literature have reported meniscectomy results, but few have focused exclusively on the lateral meniscus [10,11]. It has been well established that the lateral and medial meniscus on stable knee differ both anatomically and biomechanically. Several authors [12,13] previously showed lateral and medial meniscus lesion topography to differ. Metcalf and Barrett [12] found more anterior segment lesions in the lateral meniscus (24%, vs 1% in the medial meniscus). In the present series, most lesions were complex or vertical, whereas Terzidis et al. [13] found lateral meniscus lesions to be principally radial. Metcalf and Barrett [12] and Terzidis et al. [13] found radial lesions to be significantly more frequent in the lateral than in the medial meniscus. The present series, in contrast, comprised only 4% of radial lesions. This difference is doubtless due to differences in description. Dandy [14], in a large series of 1000 meniscectomies, did not describe any horizontal type and found 54% of lateral meniscus lesions to be vertical. In all recent reports, however, the rate of horizontal lesion was high (between 26 and 32%) as in the present series.

At 6 months' FU, we found no rapid chondrolysis, a flagship complication of the lateral meniscus [1–3]. Mariani et al. [2] recently hypothesized that chondrolysis was due to postero-external rotational instability secondary to lateral meniscectomy. In the present series, the popliteal hiatus was systematically conserved. The YAG laser used to be implicated in the development of this complication [15]. Nevertheless, we did have a difficult postoperative course in 12% of cases.

Fabricant et al. [7] recently analyzed predictors of good recovery, but without comparing lateral and medial menisci in their prospective study; only female gender emerged, as a poor short-term prognostic factor. Lubowitz et al. [8] studied resumption of activity following knee arthroscopy in a series of 72 patients, 100% of whom were able to resume light activities such as walking and housework at 1 month post-surgery. In the present series, only 30% of patients could resume light activity at 1 month, according to the subjective IKDC questionnaire. Frobell et al. [9] examined KOOS in young athletic patients with and without knee trauma; in the present series, the KOOS values were lower than for Frobell et al. — but our population was older (mean age: 56 years) and less athletic. Even so, it would seem that 6 months are required for patients treated for lateral meniscal lesions to recover their previous level of activity. To the best of our knowledge, the literature contains no studies dedicated to the lateral meniscus that would enable the present findings to be corroborated. The present study, however, has an important limitation, with 46% of patients lost to follow-up at 6 months.

Conclusion

The present study found a long and sometimes problematic postoperative course — probably more than in case of medial meniscus lesion, although that remains to be demonstrated in a comparative prospective study. Six months seem to be required for patients to recover activity levels after lateral meniscus lesion treatment. This period should be stated in the prior information given to patients.

References