Clinical course of knees with asymptomatic meniscal abnormalities: findings at 2-year follow-up after MR imaging-based diagnosis

Zanetti, M; Pfirrmann, C W A; Schmid, M R; Romero, J; Seifert, B; Hodler, J


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Abstract

PURPOSE: To prospectively evaluate the clinical course of asymptomatic meniscal lesions diagnosed by using magnetic resonance (MR) imaging. MATERIALS AND METHODS: Institutional review board approval and informed consent were obtained. The clinical courses of meniscal lesions in 84 asymptomatic knees (in 48 men and 36 women; mean age, 43.6 years; age range, 18-73 years) were assessed. Thirty-one asymptomatic meniscal lesions were depicted among the 84 knees at MR imaging. The follow-up period was at least 2 years (mean, 29.8 months; range, 24-36 months). Knee pain, stiffness, and function during daily and sports activities were assessed by using a visual analogue scale (VAS), on which a score of 0 indicated no pain or complaints and a score of 100 indicated maximal pain and/or complaints. The chi2 test was used for statistical analysis. RESULTS: At follow-up, 12 (39%) of the 31 patients with and 10 (19%) of the 53 patients without meniscal lesions reported having knee pain (P = .046). Nine (29%) patients with and five (9%) patients without meniscal lesions reported having knee stiffness (P = .02). Ten (32%) patients with and five (9%) patients without meniscal lesions reported having impaired function during daily activities (P = .008). Thirteen (42%) patients with and 15 (28%) patients without meniscal lesions reported having impaired function during sports activities (P = .20). Mean VAS scores ranged from 22 to 30; mean VAS scores for pain, stiffness, impaired daily function, and impaired sports function were 26, 22, 27, and 30, respectively. None of the initially asymptomatic knees was treated with surgery during the follow-up period. CONCLUSION: The clinical course of knees with initially asymptomatic meniscal lesions, compared with the clinical course of knees without meniscal lesions, is characterized by an increased frequency of complaints. However, severities of pain and knee function impairment remain low.
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A relatively high prevalence of meniscal tears depicted on magnetic resonance (MR) images obtained in asymptomatic subjects has been reported (1–4). Histopathologic analysis results have suggested that preexisting degeneration of the menisci predisposes subjects to traumatic or spontaneous symptomatic tears (5,6). The hypothesis that a preexisting, clinically occult meniscal lesion may be present in the asymptomatic contralateral knee has been emphasized by studies revealing that subjects with documented symptomatic meniscal tears in one knee have a more advanced degree of meniscal abnormalities in the contralateral asymptomatic knee than do control subjects of comparable age with healthy knees (1,6). However, to our knowledge, the question of whether initially asymptomatic meniscal lesions become symptomatic over time has not been addressed in the literature. Thus, the purpose of this study was to prospectively evaluate the clinical course of asymptomatic meniscal lesions diagnosed at MR imaging.
MATERIALS AND METHODS

The prospective study protocol was approved by the institutional review board of Orthopedic University Hospital Balgrist. Informed consent was obtained from all patients.

Study Population

Initially, 100 consecutive patients who were clinically suspected of having unilateral meniscal tears and had an asymptomatic contralateral knee were included in the study (1). All patients underwent MR imaging of both knees between March 2001 and February 2002. A patient questionnaire was used to guarantee the absence of symptoms in the contralateral knee. The patients had to meet all of the following criteria pertaining specifically to the asymptomatic contralateral knee, which were listed in the questionnaire: (a) The patient had no pain before or at presentation for the MR imaging examination, (b) the patient had never visited a physician owing to problems with the knee, (c) the patient’s work had never been interrupted owing to problems with the knee, (d) the patient’s sports activities had never been interrupted owing to problems with the knee, (e) surgery had never been performed in the knee, and (f) the patient was aged 18 years or older.

The clinical courses of the patients were assessed after a minimal follow-up period of 2 years (mean, 29.8 months; range, 24–36 months). One patient died during the follow-up period. The current address of five patients could not be identified. Six patients did not respond after the second written request for their consent was sent. In total, 84 patients were included in the study (31% of 16 knees). The following additional abnormalities were found among the 16 initially asymptomatic knees at MR imaging: a collateral ligament abnormality in six (7%) knees, a pericapsular soft-tissue abnormality in 11 (13%) knees, a bone marrow abnormality in three (4%) knees, and cartilage lesions in 23 (27%) knees.

Of the 31 knees with abnormal menisci, 16 had no other MR imaging abnormalities, five had an additional collateral ligament abnormality, seven had a pericapsular soft-tissue abnormality, three had a bone marrow abnormality, and nine had cartilage lesions. Nine knees had more than one additional MR imaging abnormality in the same knee. Of the 53 knees with normal menisci, 39 knees had no other MR imaging abnormalities, one had an additional collateral ligament abnormality, four had a pericapsular soft-tissue abnormality, and 14 had cartilage lesions. Five knees had cartilage abnormalities combined with pericapsular (n = 4) or collateral ligament (n = 1) abnormalities.

Statistical Analyses

Differences in the complaints at follow-up of the 84 initially asymptomatic knees between the patients with and the patients without meniscal tears were evaluated by using the $\chi^2$ test. Age-adjusted differences in the complaints were analyzed by using logistic regression. Mean VAS scores and patient ages were compared by using the Mann-Whitney U test. $P < .05$ was considered to indicate statistical significance. JMP software (SAS Institute, Cary, NC) was used to perform the statistical analyses.

RESULTS

The presence and severity of complaints that were related to the initial MR imaging knee findings and reported at follow-up are summarized in Tables 1 and 2. The mean age of the patients with menis-
Lesions and 15 (28%) patients without meniscal lesions had impaired function during sports or recreational activities (P = .20, P = .21 with adjustments for age). The mean VAS score for impaired function during sports or recreational activities was 32 in the patients with meniscal lesions and 28 in the patients without these lesions (P = .046).

The mean VAS score for knee stiffness, 8 for impaired daily function, and 19 for impaired sports function. Notably, the two patients with displaced meniscal fragments remained asymptomatic (Fig 3).

Three patients consulted with a physician owing to complaints regarding the previously asymptomatic knee. In these patients, two of the initially asymptomatic knees had a horizontal oblique tear and one knee was unremarkable. No surgery was performed in any of these knees that became symptomatic during follow-up.

The complaints regarding the knees with meniscal lesions were more common and severe (prevalence, 39%; mean VAS score for pain, 29) than the complaints regarding the knees with abnormalities of the collateral ligament (prevalence, 33%; mean VAS score for pain, 11), capsule (prevalence, 18%; mean VAS score for pain, 17), bone marrow (prevalence, 0%), and cartilage (prevalence, 22%; mean VAS score for pain, 26) (Table 2).

**DISCUSSION**

The clinical importance of many MR imaging–depicted knee abnormalities, including meniscal tears, has been debated (2,6,8,9). The present study results confirm previous assumptions that there may be preexisting abnormalities of the menisci that predispose individuals to symptomatic tears (5,6). In our study, the initially asymptomatic knees with meniscal tears became symptomatic in 39% of the patients, while the initially asymptomatic knees without meniscal tears became symptomatic in only 19% of the patients. The diagnosis of a meniscal tear was also significantly associated with impaired function during daily activities. However, pain level and complaint severity were not associated with the diagnosis of meniscal tear and remained low at follow-up. Only three patients had to consult a physician regarding complaints at follow-up, and surgery was never required.

To our knowledge, no follow-up studies addressing the clinical course of asymptomatic MR imaging abnormalities had been published before the present investigation. Published follow-up studies of MR imaging abnormalities of the knee in symptomatic patients also are rare (10,11). Boegard et al (11) found that in patients with chronic knee pain, a new meniscal abnormality appeared in three locations and did not disappear in any of the locations. In 14 (26%) of 54 locations, increased extent of the abnormality was recorded over time, and in two locations, the extent of abnormality decreased. This progression of meniscal abnormalities seen on MR images obtained in symptomatic patients is compatible with our present study findings, which showed that new symptoms appeared in initially asymptomatic knees with meniscal abnormalities after a 2-year follow-up period. Dillon et al (10) performed follow-up MR imaging in 22 patients who had intrameniscal signal intensity changes (grade 2 abnormalities [12]) at MR imaging but no meniscal tear at arthroscopy. After a mean of 27 months, most of their findings were unchanged; these data indicate that grade 2 abnor-
malities have limited clinical importance. The most common meniscal lesion seen in our study was the horizontal or oblique tear. A previously published study (1) revealed that such lesions are seen almost symmetrically in both knees, although only one knee is symptomatic. Horizontal and oblique meniscal tears appear to cause symptoms only when collateral ligament lesions or bone marrow abnormalities are present. The present study results confirm the relatively low clinical importance of these types of meniscal lesions: Surgery was never required in the knees with these lesions during the follow-up period of at least 2 years. However, the development of new minor symptoms was significantly higher in the knees with horizontal or oblique meniscal tears than in the normal knees; this finding supports the thesis that meniscal lesions may exist before symptoms appear.

A limitation of our study was that the study protocol did not include follow-up MR imaging examinations. Therefore, the possible changes in meniscal tears and the possible new MR imaging–depicted abnormalities that evolved during the follow-up period could not be addressed. In addition, collateral ligament abnormalities or bone marrow abnormalities may have become visible at MR imaging in those patients who developed symptoms during the follow-up period. Moreover, it is possible that horizontal or oblique tears increase in size or become complex tears. Complex tears may contribute to the collateral ligament and produce a collateral ligament abnormality. An association between meniscal extrusion and severe meniscal degeneration, extensive tear, complex tear, large radial tear, and tear involving the meniscal root was recently demonstrated (13). Oblique tears were rarely associated with major meniscal extrusion, however. The authors attributed the rareness of major meniscal extrusion in association with oblique meniscal tears to the fact that these types of tears are not oriented perpendicularly to the collagen fibril network and do not disrupt the structure as much as tears across the bundles (eg, radial tears) do. These findings are consistent with the thesis that more extensive tears predispose individuals to meniscal extrusion and irritation of the collateral ligaments (13).

Although the frequency of complaints in our study was significantly associated with the presence of meniscal tears, the severities of the complaints were low. The severity of the complaints was addressed by using two different methods: the widely used VAS scores and a set of items from the KOOS system. The KOOS

<table>
<thead>
<tr>
<th>Feature</th>
<th>Meniscal Abnormality</th>
<th>Collateral Ligament Abnormality</th>
<th>Capsule Abnormality</th>
<th>Bone Marrow Abnormality*</th>
<th>Cartilage Abnormality</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>31</td>
<td>6</td>
<td>11</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>Mean patient age (y)</td>
<td>50 (18–73)</td>
<td>65 (58–73)</td>
<td>63 (51–73)</td>
<td>67 (57–73)</td>
<td>55 (23–73)</td>
</tr>
<tr>
<td>Pain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients</td>
<td>12 (39)</td>
<td>2 (33)</td>
<td>2 (18)</td>
<td>0</td>
<td>5 (22)</td>
</tr>
<tr>
<td>Mean VAS score</td>
<td>29 (7–68)</td>
<td>11 (5–16)</td>
<td>17 (15–19)</td>
<td>NA</td>
<td>26 (5–68)</td>
</tr>
<tr>
<td>Stiffness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients</td>
<td>9 (29)</td>
<td>1 (17)</td>
<td>2 (18)</td>
<td>0</td>
<td>4 (17)</td>
</tr>
<tr>
<td>Mean VAS score</td>
<td>19 (4–47)</td>
<td>9</td>
<td>17.5 (13–22)</td>
<td>NA</td>
<td>22 (4–47)</td>
</tr>
<tr>
<td>Impaired daily function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients</td>
<td>10 (32)</td>
<td>1 (17)</td>
<td>2 (18)</td>
<td>0</td>
<td>4 (17)</td>
</tr>
<tr>
<td>Mean VAS score</td>
<td>21 (4–68)</td>
<td>8</td>
<td>28.5 (5–52)</td>
<td>NA</td>
<td>34 (4–68)</td>
</tr>
<tr>
<td>Impaired sports function</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of patients</td>
<td>13 (42)</td>
<td>1 (17)</td>
<td>3 (27)</td>
<td>0</td>
<td>7 (30)</td>
</tr>
<tr>
<td>Mean VAS score</td>
<td>32 (4–73)</td>
<td>19</td>
<td>34 (4–62)</td>
<td>NA</td>
<td>41 (20–74)</td>
</tr>
</tbody>
</table>

Note.—For numbers of patients, numbers in parentheses are percentages. For mean values, numbers in parentheses are ranges. On the VAS, a score of 0 indicated no pain or complaints and a score of 100 indicated maximal pain and/or complaints. The mean follow-up time was 29.8 months (range, 24–36 months).

* NA = not applicable.
is a reliable parameter of outcome for not only elderly patients with advanced osteoarthritis but also younger patients (7). Compared with the Western Ontario and McMaster Universities osteoarthritis index, the KOOS is preferable for assessing the outcomes of younger subjects with high expectations regarding physical activity (7).

The exclusion of 16 patients in our study represents another limitation. However, the comparable prevalence of asymptomatic meniscal lesions in the excluded group (lesion prevalence of 31% in the excluded group vs 37% in the study group) possibly indicates that there was no substantial difference in results regarding the development of symptoms between the excluded group and the study patients.

There also may have been an inclusion bias. All included patients initially had symptoms in one knee. Such patients may be exposed to trauma more commonly than the general population, or they may have abnormalities that predispose them to internal knee derangements. The presence of symptoms in one knee may alter an individual's gait and thus influence the development of clinical symptoms and abnormalities in the other initially asymptomatic knee. As a result, the frequency of symptoms reported herein may be higher than the frequency of symptoms that would have been observed if the patient cohort had been completely asymptomatic. The higher rate of complaints regarding the initially asymptomatic knees in this study can also be explained by the fact that the patients did not complete a KOOS questionnaire at the time of their initial presentation. It is possible that initial use of the KOOS questionnaire would have enabled the detection of measurable symptoms in the asymptomatic knee that were not detected with the screening questionnaire that was used. Finally, the treatment that the patients received for their symptomatic knee may have influenced the findings in the asymptomatic knee. However, none of these considerations influenced the differences in outcome between the knees with and the knees without meniscal lesions.

In conclusion, the clinical course of knees with initially asymptomatic meniscal lesions, compared with the clinical course of knees without meniscal lesions, is characterized by an increased frequency of complaints after 2–3 years. However, the severities of pain and knee function impairment remain low.

References