Cartilage Change after Arthroscopic Repair for an Isolated Meniscal Tear

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Summary: To investigate the direct effect to the cartilage caused by the meniscal repair, we examined patients who underwent an isolated meniscal repair without any other abnormalities by arthroscopic examination. A total of 17 patients were examined by second-look arthroscopy after an average interval of 9 months from the meniscal repair, and have been evaluated the status of the repaired meniscus and of the relative femoral condylar cartilage. Changes in the severity of the cartilage lesion between at the time of meniscal repair and the time of the second-look arthroscopy were considered based on the status of the repaired meniscus. Regardless of the healing status of the repair site, it was possible to prevent degeneration in the cartilage in 9 of the 10 patients who demonstrated no degeneration in the meniscal body. Of the 7 patients who demonstrated degeneration in the meniscal body, progression in cartilage degeneration was noted as 1 grade in 2 patients and 2 grades in another 3 patients. Even in those in which stable fusion of the repair site was achieved, the condition of the inner meniscal body was not necessarily maintained favorably in all cases, indicating that degeneration in the meniscal body was a risk factor for cartilage degeneration. It was concluded that recovery could not be expected even at 9 months after the repair if the lesion had already demonstrated degeneration in the meniscal body at the time of repair.

Key words meniscus, meniscal repair, cartilage, arthroscopy

INTRODUCTION

With the recent progress in arthroscopic surgical techniques and the results from research on the healing function of the meniscus, arthroscopic meniscal repair has now become technique of first choice to preserve the meniscus.

From the viewpoint of clinical symptoms, the short-term and middle-term success rate of arthroscopic meniscal repair is 88-97%, according to reports to date [1-4]. However, the complete healing rate is slightly lower, at 65-81%, from direct observations made by second-look arthroscopy [5-10]. These data suggest that considerable numbers of insufficient healing detectable only using arthroscopy are included in clinical success cases. However, we cannot think that insufficient healed menisci function enough because there is not clinical symptoms.

We consider that the most important objective is the repaired meniscus fully functioning, and this can be determined by evaluation of the cartilage tissue before and after the meniscal repair because the main function of the meniscus is to prevent cartilage damage. Accordingly, we have conducted second-look arthroscopy to evaluate the condition of the cartilage before and after meniscal repair and to investigate its relation to the condition of the repaired meniscus. To eliminate uncertain factors other than the meniscus as much as possible, only those patients who had an

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isolated meniscal tear with no complicating abnormality were investigated in this study.

MATERIALS AND METHODS

A total of 58 patients underwent second-look arthroscopic evaluation following meniscal repair, at our hospital during the period from 1989 to 1997. We used the following criteria to exclude patients from this study: 1) any associated ligament injury requiring surgery, 2) both lateral and medial meniscal tear, 3) tear of the discoid meniscus, 4) critical cartilage lesion (grade 2 or more) at the time of meniscal repair, 5) associated fracture and/or chondral fracture, 6) an abnormal radiograph, 7) an abnormal contralateral knee. As a result, 17 menisci (8 medial menisci, 9 lateral menisci) in 17 patients (15 men, 2 women) remained and were evaluated in this study. The mean age at the time of meniscal repair was 24 years (range, 9-47). The average interval from injury to the repair was 7 months (range, 0.1-43). The average interval from the repair to the second-look arthroscopy was 9 months (range 6-20).

Meniscal repair

The indication for meniscal repair was the following: 1) a vertical or oblique tear in the outer half of the meniscus, 2) a tear more than 1 cm in length, and 3) an unstable meniscus. Although status of inner meniscal body was not include in the indication, it was carefully evaluated and recorded in an operative report. The surgical technique was essentially that of Henning [11]. A popliteal retractor was inserted between the gastrocnemius and posterior capsule. Under arthroscopic control, parasympathetic tissue at the tear site was abraded using a rasp. Multiple non-absorbable sutures (2-0 Ethibond) were placed every 5 mm in the tear in a stacked manner, so that the torn meniscus was fixed firmly to the capsule. Postoperatively, the knee was immobilized for 1 to 2 weeks, and full weight bearing was permitted after 5 to 6 weeks. Vigorous activity was not allowed for 4 to 6 months.

Second-look arthroscopy

Before the meniscal repair was performed, we explained to the patients the need for later arthroscopic evaluation of the repaired menisci, even if there were no symptoms. Four of the 17 patients had slight pain and needed arthroscopic treatment. Although the other 13 patients had no symptoms, they gave informed consent. We classified meniscal healing at the repair site into three categories. ‘Excellent’ signified almost complete healing with no visible unhealed area. ‘Good’ was incomplete healing with partial-thickness defect. And ‘Poor’ was no healing with a full-thickness defect. The state of the meniscal body was also evaluated and classified into two categories. ‘Normal’ was when the meniscal body showed no degeneration and no newly-formed tear. ‘Abnormal’ was when the body showed either degeneration or a newly-formed tear. All meniscus evaluations were performed by carefully visualization and probing, and then, results were recorded in operative reports and were used in this study.

Method of evaluations

We video-recorded the articular cartilage at the time of meniscal repair and at the time of the second-look arthroscopy. We reviewed the videotapes and classified the severity of the femoral cartilage lesions based on the grading system of Outerbridge [12]. This grading system may have inter- and intra-observer variability [13,14]. Thus, two senior doctors (TS and HM) evaluated individually at two different time points and a most severe grade was accepted. Changes in the grade of the cartilage lesion between at the time of meniscal repair and the time of the second-look arthroscopy were classified into three categories as; -0-up; change in the grade of lesion was nothing or improvement, 1-up; deterioration in the lesion was 1 grade, and 2-up; deterioration in the lesion was 2 grades. Results of cartilage change were considered based on the status of the repaired meniscus.

Statistical analysis

Results of cartilage change were considered based on the status of the repaired meniscus as following: the state of healing at the repair site, the state of the meniscal body, and the medial-lateral difference. Chi-square test and Fisher’s exact probability test were used for statistical analysis to analyze differences and to clarify relationship. The influence of the age of the patients, interval from injury to the meniscal repair, and interval from the meniscal repair to the second-look arthroscopy were also considered by Mann-Whitney’s U test. The statistical significance was predetermined at p=0.05.

RESULTS

Changes in the cartilage status are summarised in
RESULTS OF ARTHROSCOPIC REPAIR

<table>
<thead>
<tr>
<th>Cartilage status at the time of meniscal repair</th>
<th>Cartilage status at the time of second-look arthroscopy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade 0</td>
<td>Grade 1</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>State of the meniscal body</th>
<th>State of the repair site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Excellent</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Abnormal</td>
<td>5</td>
</tr>
</tbody>
</table>

Chi-square test: p=0.66

Table 1. Change of cartilage status between the time of meniscal repair and the second-look arthroscopy.

Table 2. Status of the repaired menisci at the time of second-look arthroscopy.

Fig. 1. Cartilage changes in relation to healing at the repair site and meniscal status.

The grading into excellent, far and poor is related to meniscal healing at repair site. The grading into normal and abnormal is related to status of meniscal body.

Table 1. At the time of the meniscal repair, there were 11 cases of grade 0 and 6 cases of grade 1. At the time of the second-look arthroscopy, there were 8 cases of grade 0, 5 cases of grade 1, 3 cases of grade 2, and 1 case of grade 3. Only one case improved from grade 1 to grade 0. There was no case that deteriorated more than 3 grades. Overall, 11 cases (64%) were classified as 0-up, 3 cases (18%) as 1-up, and 3 cases (18%) as 2-up.

The second-look arthroscopic findings of the repaired menisci are summarised in Table 2. There were 10 cases (59%) with ‘excellent’, 3 cases (18%) with ‘good’, and 4 cases (24%) with ‘poor’ state of healing at the repair site. In all the poor cases, the repaired menisci were still kept stably by the non-absorbable suture line though they were not healed. On the state of the meniscal body, there were 10 normal cases (59%) and 7 abnormal cases (41%). Degeneration in the meniscal body was seen in the inner region and never at the periphery. Four cases showed minimal degeneration in the meniscal body at the time of the meniscal repair, and this had not recovered at the time of the second-look arthroscopy. Remaining 13 cases showed no degeneration in the meniscal body at the time of the meniscal repair, however, three of them degenerated at the time of the second-look arthroscopy. There was no significant correlation between the state of the meniscal body and the state of healing at the repair site (chi-square test: p=0.66).

The correlation between the change in cartilage status and the state of the repaired meniscus is shown in Fig. 1. In those with a normal meniscal body, although only one case showed 1-up, the remaining 9 cases showed 0-up regardless of the healing at the repair site. In the abnormal group, there was a case of 2-up in each group of state of healing at repair site, and 2 cases showed 1-up even in the excellent group. A significant difference did not existed between the cartilage deterioration and the state of healing at the repair site (chi-square test: P=0.87), however it existed between the cartilage deterioration and the state of the meniscal body (Fisher’s exact probability test: P=0.04), when the cartilage deterioration was defined as both 1-up and 2-up. Thus, there was a trend that deterioration in cartilage lesion was more affected by the state of the meniscal body than that by the achieved state of healing at the repair site.

The age of the patients, interval from injury to
the meniscal repair, interval from the meniscal repair to the second-look arthroscopy, and the medial-lateral differences showed no correlation to the cartilage deterioration (Mann-Whitney’s U test: P = 0.08, 0.23, 0.85, Fisher’s exact probability test: P = 0.62, respectively).

DISCUSSION

The main purpose of meniscal repair is to protect the cartilage. Therefore, it is very important to evaluate changes in the cartilage after meniscal repair. To this end, it is necessary to evaluate those patients who receive meniscal repair alone without any other abnormalities.

Rockborn et al. [15] compared 31 patients who had an isolated meniscal tear without ligament damage with a matched control group, and reported that some osteoarthritis change on radiological examination was observed in 1 patient in the control group and in 7 patients in the repair group within a mean of 13 years. Similarly, Johnson et al. [16] examined 50 isolated meniscal repairs in 48 patients and reported that minimal joint changes on radiological examination were noted in 8% of the operated side and 3% of the unaffected side after 10 years from operation. These reports suggested that the repaired meniscus did not fully recover its function so as to prevent any changes detected by X-ray. However, it takes a long time for the radiographic examination to capture any significant change after operation. Not only that, it is not possible to eliminate the influence of individual differences in the changes caused by aging of the patient during that period. In fact, Rockborn et al. [17] reported that the meniscal repair achieved better results than meniscectomy after 7 years from operation but that there was no difference even between the successful repair cases and the meniscectomy cases at the time of another survey conducted in the same patients after 13 years. Although long-term follow-up results may be of great interest to the clinician, a long interval after the operation may obscure the direct effect of the repair or even any negative effect. This possibility should be considered in the situation of an isolated meniscal tear. The isolated meniscal tear without ligament damage may already hold a latent possibility to degenerative joint changes.

In this regard, we decided to investigate the direct effect of repair in an isolated meniscal tear only within the short-term. For this purpose, we selected the patients that had only an isolated meniscal tear without cartilage damage assessed as grade 2 or higher at the time of repair. Then, the condition of the repaired meniscus and that of the related femoral condyle cartilage were investigated by second-look arthroscopy after a mean interval of 9 months from the operation. As a result, cartilage deteriorated in 6 cases (36%); 3 cases (18%) as 1-up, and 3 cases (18%) as 2-up. The cartilage changes observed by us were not substantial ones that could be confirmed by X-ray, and will not always lead to the osteoarthritis. However, this result suggests to us that the repaired meniscus is not fully functioning. The factor that led to cartilage changes is the degeneration in the inner meniscal body rather than the repair site. Even if stable fusion is achieved in the repair site, the condition of the inner meniscal body is not always favorably retained in all patients. Especially, we should bear in mind that no recovery is expected even at the time of second-look arthroscopy if the lesion already demonstrated degeneration at the time of repair.

Recently, some reports [18-20] have even proposed an extremely aggressive repair technique. Our results do not deny such efforts since the meniscectomy leads to later osteoarthritis. However, more careful follow-up will be needed in such cases.

REFERENCES