

Long-Term Results of the Arthroscopic Meniscectomy Following Non-Traumatic Tears Due to Mucoïd Degeneration and Traumatic Tears

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ABSTRACT

BACKGROUND/AIM: In this study, we aimed to radiologically and clinically compare the long-term results of arthroscopic meniscectomy in patients with non-traumatic meniscal tears due to mucoïd degeneration (MD) (Group A) and those with traumatic tears (Group B). MD of the meniscus may indicate degenerative osteoarthritis (OA) of the knee or it may be a manifestation of a tendency to OA. Hence, non-traumatic meniscal tears of the knees treated with arthroscopic meniscectomy are more likely to develop into degenerative OA.

MATERIALS AND METHODS: A total of 38 patients (Group A: n=20 and Group B: n=18) aged 18 to 45 years, who underwent arthroscopic meniscectomy between 1995 and 2005, with an average follow-up period of 15 years (range: 11–21 years) were retrospectively analyzed. A senior orthopedic surgeon's arthroscopic database was used. The Lysholm score was used for the clinical comparison between the study groups. Radiographic changes were graded using the Kellgren–Lawrence classification of knee OA.

RESULTS: The demographic features and treatment protocols were the same for both groups. After a mean 15-year follow-up, the Lysholm score was found to increase following arthroscopic meniscectomy. Radiographic evaluation revealed grade 1 early degenerative changes in both groups according to the Kellgren–Lawrence classification.

CONCLUSION: The clinical and radiological outcomes of both the study groups were statistically similar in terms of clinical recovery and radiographic degenerative findings.

Keywords: Meniscus mucoïd degeneration, knee trauma, sports injury

INTRODUCTION

The menisci play a critical role in knee biomechanics, including in the prevention of articular degenerative changes.^{1,2} Other crucial functions of these fibrocartilaginous structures include shock absorption, load distribution, enhancing articular viscosity, contributing to knee stability, and proprioception.³⁻⁵

Meniscal tears usually develop as a result of knee trauma in young people; tears may also develop without any significant trauma in some

cases. However, non-traumatic tears have not received much attention in the literature.⁶ Degenerative lesions of the meniscal tissues can be classified as dystrophic or metastatic calcifications, hyaline acellular degeneration, or mucoïd degeneration (MD).⁷ MD of the meniscus should therefore be suspected when the meniscus is torn in a young healthy knee without any history of significant trauma. MD is characterized by an excessive accumulation of proteoglycan fragments in the interstitial tissue of the menisci.^{6,8} Despite its relatively common occurrence, it has received little attention in the literature and its etiology remains

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uncertain. Therefore, more emphasis on MD is deemed necessary owing to its tendency to cause the loss of the meniscus, depending on the type of the tear. A previous study conducted at our department revealed that advanced stages of meniscal MD are correlated with increased proteoglycan fragment concentrations in the synovial fluid. Our findings suggest that this correlation may be associated with the degenerative processes occurring in the joint.⁸

In selected cases, arthroscopic partial meniscectomy has been accepted as the standard treatment of certain choices for meniscal tears, when preservation is not possible.^{9,10} However, several studies with long-term follow-ups (>10 years) have shown that arthroscopic meniscectomy increases the risk of degenerative changes in the knee joint and has adverse effects on the functional and clinical outcomes.^{2,11,12} Subtotal meniscectomy has also been known to be associated with early degenerative changes in the knee joint to a lesser extent in comparison to total meniscectomy. Hede et al.¹³ reported on the long-term results of partial and total meniscectomies in a randomized controlled study and revealed that the size of a resected meniscal tissue is correlated with a decrease in the functional outcomes of the knee. Another study also proved that meniscectomy causes irreversible damage to the knee joint.^{4,12}

The present study aimed to compare the clinical and radiological outcomes of arthroscopic meniscectomy in patients with non-traumatic meniscal tears due to MD (Group A) and those with traumatic tears (Group B). Therefore, the hypothesis of this study is that non-traumatic meniscal tears due to MD have worse clinical and radiological outcomes than traumatic tears.

MATERIALS AND METHODS

A total of 38 patients aged 18–45 years who were treated arthroscopically by a senior orthopedic surgeon in our clinic between 1995 and 2005 and who had visited the outpatient clinic within the previous 2 years were included in our study (we requested our patients to visit for follow-up every 4 or 5 years in the period 5 years after the operation). Patients were selected for this study using the senior orthopedic surgeon's patient archive. All patients were diagnosed, treated, and followed up by a single surgeon. MD was diagnosed clinically during the operation. Those patients with a history of anterior cruciate ligament rupture and meniscal repair, those with a repeat surgery on the same knee, and those lacking preoperative and postoperative evaluation as well as non-ambulatory care were excluded from this study.

Among the patients with cartilage lesions detected during arthroscopic meniscectomy, debridement with a shaver was applied to Outerbridge grade 1 and 2 patients and microfractures were applied to grade 3 and 4 patients. Patients who had microfractures as a result of arthroscopic meniscectomy were advised to perform a range of motion exercises for 4 weeks without weight, whereas the other patients were allowed to move with full weight.

When the patients visited the outpatient clinic, their examinations and X-ray evaluations were conducted by an orthopedic surgeon and a senior orthopedic assistant. A total of 20 patients with non-traumatic meniscal tears due to MD were assigned to Group A and 18 patients with traumatic meniscal tears were assigned to Group B (Figure 1).

In this study, the patients in both groups A and B were evaluated in terms of age, sex, body mass index (BMI; kg/m²), time to follow-up,

duration of complaints, physical examination, knee-related radiological and functional scores, and their preoperative and postoperative Lysholm scores.

Approval for this study was obtained from the Non-Interventional Ethics Committee of Dokuz Eylül University decision no: 2015/27-19, date: 03.12.2015).

Statistical Analysis

Firstly, the patients in the two groups were compared in terms of their age, BMI, follow-up times, duration of complaints, and their affected knee. Parametric and nonparametric data between the two groups were compared both within and between the groups. Gender, operated side of the knee, duration of complaint, follow-up duration, preoperative cartilage lesions, postoperative physical examination findings, Kellgren–Lawrence classification, and the type of operation performed were evaluated using the Chi-Square test. Preoperative and postoperative Lysholm scores were evaluated using the Wilcoxon test. BMI was evaluated using the student's-test. A p-value of <0.05 was considered statistically significant.

SPSS 22.0 statistical analysis software (IBM, Chicago, IL, USA) was used for all analyses.

RESULTS

A total of 38 patients, including 20 patients with meniscal tears without trauma (Group A) and 18 patients with traumatic meniscal tears (Group B), were evaluated. The mean distribution of age, gender,

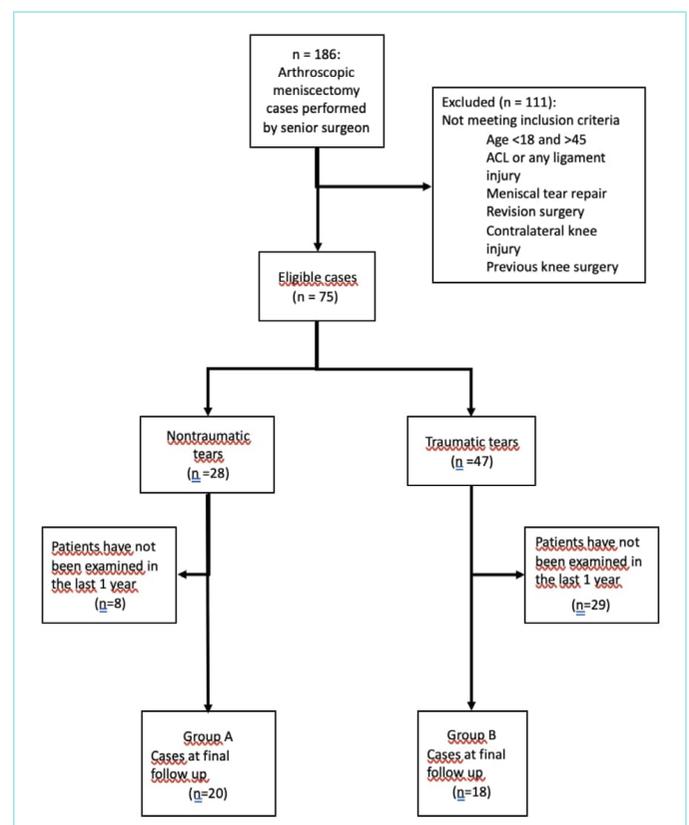


Figure 1. The patient selection scheme used in the study.

ACL: anterior cruciate ligament, n: number

BMI, and follow-up period in both the groups was similar. The average duration of complaints in Group A and Group B was 24.5 and 8.3 months, respectively ($p=0.013$). The involvement of menisci and tear localization was similar in both the groups ($p=0.387$ and $p=0.127$, respectively) (Table 1). The distribution of side meniscal tears and localization meniscal tears was also similar (Table 2). Regarding the type of arthroscopic meniscal resection, 16 partial and four subtotal meniscectomies were performed in Group A and 11 partial, six subtotal, and 1 total meniscectomies were performed in Group B; hence, no significant difference was noted between the groups ($p_{\text{chi-squared}}=0.32$). Chondral lesions according to the Outerbridge classification system were similar between the two groups ($p_{\text{chi-squared}}=0.152$). Groups A and B showed similar outcomes in terms of the location of the cartilage lesions (femur, tibia, and patella) ($p_{\text{chi-squared}}=0.712$; Table 3). Cartilage lesions were treated as described in the method section. Joint line tenderness was positive in eight patients in Group A and in 10 patients in Group B. However, no significant difference was noted between the two groups ($p=0.338$).

According to the Kellgren–Lawrence classification system, 15 patients (39.5%) were classified as grade 0, nine patients (23.7%) as grade 1, six patients (15.8%) as grade 2, three patients (7.9%) as grade 3, and one patient (2.6%) as grade 4. The Kellgren–Lawrence grade at the follow-up showed a mean value of 1 ± 1.1 for Group A and 1 ± 1.2 for Group B. No significant difference was noted between the two groups according to Kellgren–Lawrence ($p=0.72$) classification.

Lysholm scores significantly improved in both groups at follow-up. In addition, the results were found to be similar in both groups at follow-up ($p=0.609$) (Table 4). Evaluation of the final control Lysholm scores revealed 65% excellent and 35% good results in Group A, 72.7% excellent and 22.8% good results in Group B, and 68.4% excellent and 28.9% good results for all patients (Table 5).

DISCUSSION

In this study, improvement in the postoperative Lysholm scores was noted in both groups, but no statistical significance was detected between the groups in terms of radiological and clinical results. As a result, recovery was recorded in both groups after 15 years of follow-up. Radiologically, the Kellgren–Lawrence scores were also similar in both groups. During our research, we found no study on the comparison of the outcomes of traumatic and non-traumatic meniscus tears due to MD.

MD may lead to a loss of meniscus and result in early degenerative changes in the knee joint. Chatain et al.¹⁴ reported that 5 years after arthroscopic meniscectomy, degenerative changes in the knee in patients aged >35 years were more common than those in younger patients. In another study by Burks et al.¹⁵, 146 patients with a 15-year follow-up period were evaluated and it was concluded that age does that affect degenerative changes in the knee joint. The findings of the present study were similar to those reported by Chatain et al.¹⁴ In the present study, the average age of the patients in Groups A and B was 35 years. Considering our follow-up period of 15 years, detection of early degenerative findings seems likely. When preoperative and follow-up ages were considered, radiographic changes seemed suggestive of early osteoarthritis (OA). Our study results are similar to those of Chatain et al.¹⁴ Although they did not divide the patients into those with traumatic and those with non-traumatic meniscal tears, the lesion mechanism in the patients without a history of trauma could be traced to MD, as in our study.

In a prospective cohort study by Lizaur-Utrilla et al.¹⁶, 258 patients underwent arthroscopic partial meniscectomy, including 115 patients with degenerative meniscal tears and 143 with traumatic tears. The patients belonged to the middle

Table 1. Demographic information of the patients

| Demographic information | Group A (n=20) | Group B (n=18) | p-value |
|--|----------------|----------------|--------------|
| Age (year, median, min–max) | 37.5 (18–42) | 38.5 (19–44) | 0.986* |
| BMI (kg/m ² , mean, SD) | 28.5 (3.9) | 28.2 (4.34) | 0.813** |
| Follow-up (year, median, min–max) | 15 (11–18) | 14 (11–21) | 0.929* |
| Gender | | | |
| Male | 13(65%) | 9(50%) | 0.363 |
| Female | 7(35%) | 9(50%) | |
| Average duration of complaints (months, mean) | 24.5 | 8.3 | 0.013 |

*Mann–Whitney U test for comparison of non-parametric values, **t-test for comparison of parametric values.

Significant values are shown in bold.

min: minimum, max: maximum, SD: standard deviation.

Table 2. Distribution of meniscaltears of side and meniscaltears of localization

| | Medial | Lateral | Medial-Lateral | | |
|---------|----------|---------|------------------|-----------|---------|
| Group A | 11 | 7 | 2 | p=0.387 | |
| Group B | 11 | 7 | 0 | | |
| | Anterior | Middle | Middle-Posterior | Posterior | |
| Group A | 0 | 4 | 8 | 8 | p=0.127 |
| Group B | 0 | 0 | 8 | 10 | |

Table 3. Cartilage lesions noted according to Outerbridge Classification and localization

| | Grade 0 | Grade 1 | Grade 2 | Grade 3 | Grade 4 | p=0.152 |
|---------|---------|---------|---------|---------|---------|---------|
| Group A | 11 | 6 | 1 | 2 | 0 | |
| Group B | 8 | 3 | 6 | 1 | 0 | |
| | Normal | Femur | Tibia | Patella | p=0.71 | |
| Group A | 11 | 4 | 7 | 1 | | |
| Group B | 9 | 6 | 5 | 2 | | |

Table 4. Lysholm Scores changes

| Lysholm Score | Pre-operative | Post-operative | p-value |
|--------------------|---------------|----------------|----------|
| Group A (mean, SD) | 74.7±9.7 | 87.1±11.2 | p<0.001* |
| Group B (mean, SD) | 67.8±18.4 | 85.1±13.3 | p<0.001* |

*paired t-test, SD: standard deviation.

age group (45–60 years) and had no or only mild signs of OA. In Lizaur-Utrilla et al.'s¹⁶ study, parallel to our study, no radiological difference was found between the two groups. However, in their study, the mean age of the patients was higher, the follow-up periods were shorter, and whether or not the degenerative tears were based on MD was not specified. On the other hand, in a multicenter comparative prospective cohort study conducted by Thorlund et al.¹⁷, 115 traumatic patients and 227 patients with degenerative meniscal tears aged 18–55 years who were treated with arthroscopic partial meniscectomy were followed up for approximately 1 year. After the 1-year follow-up, the functional recovery of the traumatic tears was found to be better than that of the degenerative tears.¹⁷ Based on these previous studies, we can state that although the results of traumatic and degenerative meniscal tears treated with arthroscopic partial meniscectomy were more favorable for traumatic tears in the short term, no functional difference was noted in the long term.

Ferrer-Roca and Vilalta⁷ stated that meniscal tears due to mucoid MD are usually horizontal, whereas Smillie¹⁸ stated that MD usually leads to radial tears in the medial meniscus and horizontal tears in the lateral meniscus. In the present study, although statistically not significant, most of the tears in the MD group were found to be either horizontal or complex and slightly more common in the medial meniscus rather than in the lateral meniscus. In contrast to those in the MD group, traumatic meniscal lesions showed a tendency to be longitudinal and complex rather than horizontal.¹⁹ Arthroscopically repaired menisci were excluded from the study.

Some long-term studies (>10 years)^{2,11} on arthroscopic meniscectomy have reported that degenerative changes have negative effects on

functional and clinical results. However, in short-term follow-up studies, arthroscopic meniscectomy reportedly relieved meniscal symptoms.^{20,21} Rockborn and Gillquist²², in their long-term study (a follow-up period of 12–15 years) of 60 meniscectomy patients aged 20–40 years, revealed significant degeneration radiologically, good functional scores, and an increased interest in active sports in comparison to the preoperative period. A detailed review of the findings of Rockborn and Gillquist²² indicated similar results to those of the present study. In addition to the other studies mentioned earlier, this study was also a long-term study and early degenerative changes were detected in the knee joint; however, the functional and clinical outcomes of our study were satisfactory.

In a study by Hoser et al.²³, 29 patients with a history of arthroscopic meniscectomy and an average age of 43.8 years were followed up for approximately 10.3 years and their average Lysholm score was found to be 80.5±16.7. The authors grouped patients according to their Lysholm scores and reported 45.2% as excellent, 12.9% as good, 16.1% as fair, and 25.8% as poor outcomes. In the present study, the average postoperative Lysholm scores of groups A and B were 87.1 and 85.1, respectively. There was an increase in the scores when compared with the preoperative values indicating clinical recovery. When the Lysholm scores at follow-up were analyzed separately for the groups, the results were 65% as excellent and 35% as good in Group A and 72.7% as excellent, 22.8% as good, and 5.5% as poor in Group B. Overall, the results were 68.4% as excellent, 28.9% as good, and 2.6% as poor. Higher Lysholm scores in the present study than those in the study by Hoser et al.²³ may be attributed to a lower average age and the higher activity levels of our patients.

Limitations of the Study

To date, no study in the literature has compared degenerative meniscal tears due to MD with traumatic meniscus tears, which makes the long-term follow-up period in the present study the strength of this study. However, the retrospective nature of the study and small sample size are the weak points of this study.

CONCLUSION

We observed that 97% of the patients who had undergone arthroscopic meniscectomy with a mean follow-up of 15 years in this study had good or excellent outcomes and their long-term radiographical and clinical outcomes after arthroscopic meniscectomy were similar for those patients who had either traumatic or non-traumatic meniscal tears due to MD.

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Table 5. Lysholm Scores changes

| Pre-op and post-op Lysholm Scores | | Poor 0–20 | Moderate 21–40 | Moderate-Good 41–60 | Good 61–80 | Excellent 81–100 |
|-----------------------------------|---------|--------------|-------------------|------------------------|---------------|---------------------|
| Group A | Pre-op | - | - | 2 (10%) | 12 (60%) | 6 (30%) |
| | Post-op | - | - | - | 7 (35%) | 13 (65%) |
| Group B | Pre-op | 1 (5.5%) | 1 (5.5%) | 3 (16.6%) | 7 (38.8%) | 6 (33.3%) |
| | Post-op | - | - | 1 (5.5%) | 4 (22.8%) | 13 (77.7%) |

Pre-op: pre-operative, Post-op: post-operative.

MAIN POINTS

- Meniscus MD, which causes meniscus tears in young patients with minor traumas, has been rarely studied.
- The long-term results of those patients who had undergone meniscectomy with the correct indication are good.
- When traumatic tears and tears due to MD were compared clinically and radiologically, no difference was found.

ETHICS

Ethics Committee Approval: This study was approved by the Ethics Committee of the Dokuz Eylül University Medical School (decision no: 2015/27-19, date: 03.12.2015).

Informed Consent: This study was designed and implemented retrospectively, no consent to participate.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: Y.E.B., Design: Y.E.B., Supervision: H.P., Data Collection and/or Processing: Y.E.B., O.N.E., Analysis and/or Interpretation: Y.E.B., O.N.E., H.P., Literature Search: Y.E.B., O.N.E., H.P., Writing: Y.E.B., O.N.E., Editing: H.P.

DISCLOSURES

Conflict of Interest: No conflict of interest was declared by the authors.

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