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Orthopedics and Traumatology

Is osteophyte located in the inferior of the intermeniscal ligament an indication for the surgical treatment of degenerative meniscal tear?

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ABSTRACT

Objectives: Our study aimed to determine how often the osteophyte located underneath the anterior intermeniscal ligament is observed in patients who underwent arthroscopic surgery due to degenerative meniscal tears, how often this osteophyte can be diagnosed by magnetic resonance imaging, and whether this osteophyte could be an indication for the surgery to be performed for degenerative meniscopathy.

Methods: Our retrospective study included 47 patients operated for degenerative meniscus tears between 2017 and 2018, with a minimum follow-up of 2 years. Visual analog scale (VAS), Lysholm knee, and Western Ontario Meniscal Evaluation Tool (WOMET) scores were applied to all patients included in the study preoperatively and at the postoperative 3rd, 6th, 12th, and 24th months. The operated patients were grouped into two groups with and without osteophytes beneath the anterior intermeniscal ligament in magnetic resonance imaging (Group A and B). Preoperative and postoperative values of the patients were compared among themselves.

Results: The average age of the patients included in our study was 57 (range: 42 to 72) years. Forty (85%) participants were female. Osteophyte was detected in 36.1% (n = 17) of the patients in preoperative magnetic resonance imagings (Group-A). There was a statistically significant difference between preoperative VAS, Lysholm, and WOMET scores and postoperative 3rd, 6th, 12th, and 24th months ($p < 0.05$). Mean follow-up time was 32 (range: 24 to 60) months.

Conclusions: We believe that arthroscopic control of the inferior intermeniscal ligament for the presence of any osteophytes in patients treated surgically for degenerative meniscal tears is one of the main steps of this surgery.

Keywords: Degenerative meniscus, intermeniscal ligament, osteophyte, meniscectomy

The anterior intermeniscal ligament connects the lateral and medial menisci in the tibial plateau. The length of the anterior intermeniscal ligament (AIL) is approximately 33 mm, and its thickness at the insertion to the meniscus is about 3 mm. Therefore, it can rupture faster [1, 2]. Ex vivo studies have proven

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that the anterior intermeniscal ligament plays a role in the biomechanics of the knee, reducing the femorotibial contact area, spreading the intra-knee pressure force, and distributing the load between the menisci [3, 4].

The etiology of meniscal tears varies depending on age. While tears occur due to major trauma in young people, as age increases, degenerative meniscus tears occur, especially over the age of 45. At the age of 70, its prevalence rises to 50% [5]. Although there is no history of trauma in degenerative tears, they sometimes occur due to minor trauma. Degenerative meniscal tear is also common with knee osteoarthritis. A study conducted with 174 osteoarthritis patients over 45 years of age who presented with unilateral knee pain revealed a symptomatic meniscal tear in 24% on magnetic resonance imaging (MRI) [5]. However, it is also seen in patients without radiological signs of osteoarthritis [2].

The hypothesis that guides our study is that the osteophyte located beneath the anterior intermeniscal ligament is the primary source of pain during walking in patients with a degenerative meniscal tear by causing limitation of extension and debriding this osteophyte will have a positive effect on the postoperative clinical results.

In the study, how often osteophytes located beneath the anterior intermeniscal ligament are observed in patients undergoing arthroscopic surgery due to degenerative meniscal tear, whether it can be diagnosed preoperatively with MRI, and whether it can be used as an indication criterion for surgery for degenerative meniscopathy were investigated.

METHODS

The retrospective study included 57 patients operated due to degenerative meniscal tear in our hospital's orthopedics and traumatology clinic between January 2017 and June 2018, following the approval of the ethics committee (15.05.2020 i4-244-20). Inclusion criteria for the study were patients aged between 40-75 years, clinically and radiologically compatible with degenerative meniscal rupture, conservative treatment was tried for at least three months, but the pain did not decrease, and patients with radiological Kellgren and Lawrence [6] grade 0-I. Exclusion criteria were patients with a traumatic meniscal tear, meniscal root tear, anterior cruciate ligament rupture with knee locking complaint, and radiological Kellgren and Lawrence grade III-IV. Ten patients were excluded from the study, and 47 patients were included. All forty-seven patients were followed up regularly. In 17 (36.17%) of 47 patients who underwent arthroscopic surgery due to degenerative meniscal tear, osteophytes

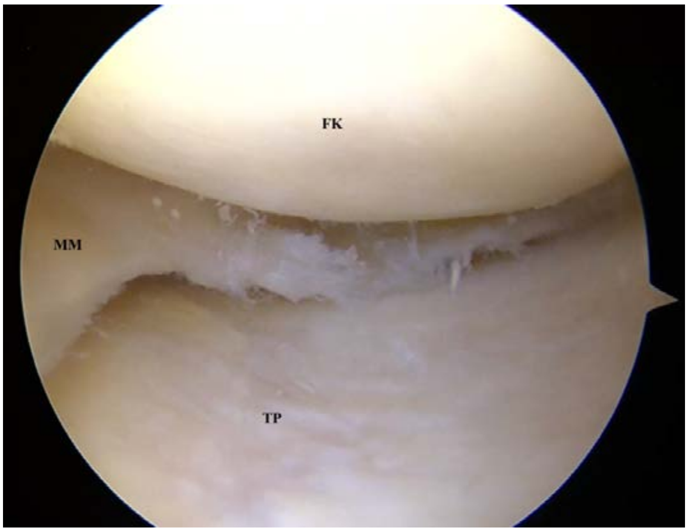

Fig. 1. The left knee is viewed from the anterolateral portal with a 300 arthroscope. Medial femoral condyle, degenerative ruptured medial meniscus, and medial tibial plateau are observed. FK = Femoral condyle, MM = Medial meniscus, TP = Tibia plato.

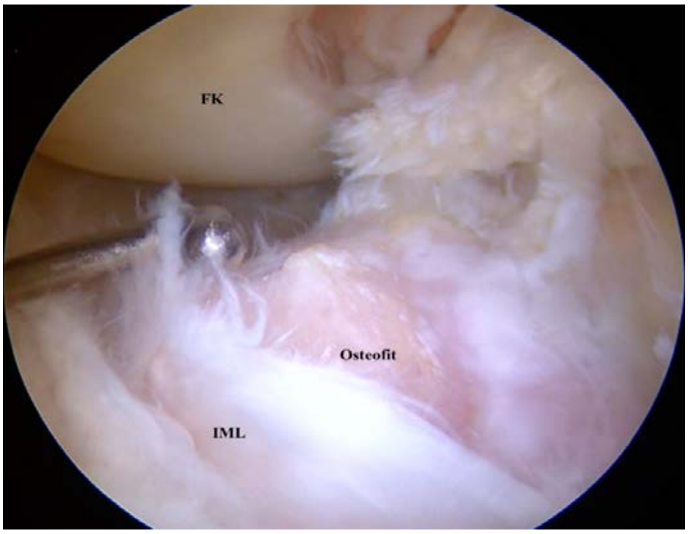

Fig. 2. The left knee is viewed from the anterolateral portal with 300 arthroscope. While the intermeniscal ligament (IML) and its surroundings are examined with the probe's help, the osteophyte borders are seen. FK = Medial femoral condyle.

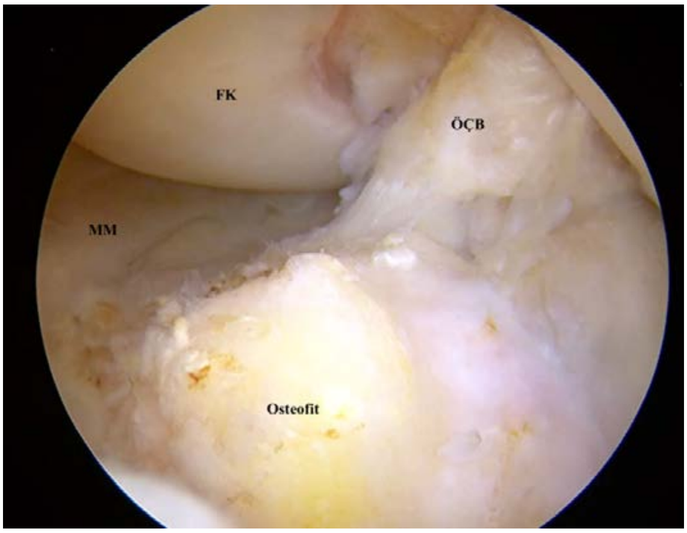

Fig. 3. **The left knee is viewed from the anterolateral portal with 300 arthroscope. When the intermeniscal ligament (IML) is retracted anteriorly with a probe, it is seen that the osteophyte is fully revealed. FK = Medial femoral condyle, ÖÇB = Anterior cruciate ligament, MM = Medial meniscus.**

located beneath the anterior intermeniscal ligament were observed in MRI (Group-A), whereas it was not seen in 30 (63.83%) patients (Group B). For the clinical evaluation of the patients, visual analogue scale (VAS) [7], Lysholm knee scores [8], Western Ontario Meniscal Evaluation Tool (WOMET) scores [9], joint range of motion were evaluated and recorded at preoperative and postoperative 3rd, 6th, 12th, and 24th months. All patients had weight-bearing and 2-view knee X-rays along with MRI preoperatively.

All patients' surgeries were performed by the same experienced surgeon (RA). After the standard anterolateral and anteromedial knee portals were opened, diagnostic arthroscopy was performed (Fig. 1). Partial meniscectomy was performed on degenerative menisci with 4.5 mm shaver (Dyonics, Smith and Nephew, USA), and arthroscopic hand tools and appropriate contour was given. In all patients, the intermeniscal ligament was examined arthroscopically with the help of an arthroscopic probe and then evaluated for osteophytes at its inferior (Figs. 2 and 3). For patients with osteophytes, osteophytes were debrided and contoured with a 5.5 mm burr (Dyonics, Smith and Nephew, USA) (Figs. 4 and 5). Active isometric quadriceps exercises were started on the 1st postoperative day in all patients. Full weight-bearing was allowed gradually in the first three weeks. Although patients could return to low-impact sports activities three months following surgery, contact sports activities were allowed at the end of the 6th month.

Statistical Analysis

SPSS 2020 package (IBM Corp. Released 2020. IBM SPSS Statistics for Macintosh, Version 27.0. Armonk, NY: IBM Corp) was used to evaluate data collected from patients. Normally distributed data are

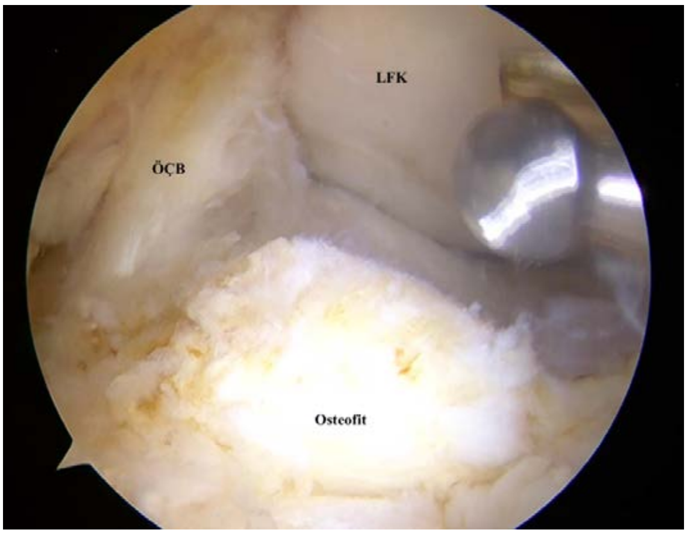

Fig. 4. **While the left knee is viewed from the anterolateral portal with 300 arthroscope, 5.5 mm burr in the anteromedial portal. Contouring the osteophyte in the inferior of the intermeniscal ligament with a 5.5 mm burr. LFK = Lateral femoral condyle, ÖÇB = Anterior cruciate ligament..**

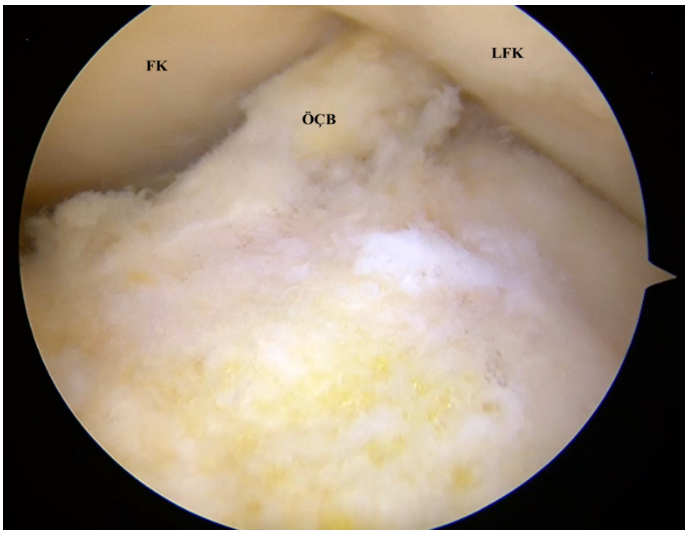

Fig. 5. **The left knee is viewed from the anterolateral portal with 300 arthroscope. The osteophyte located beneath the intermeniscal ligament (IML) is seen after the full contouring. FK = Femoral condyle, ÖÇB = Anterior cruciate ligament, LFK = Lateral femoral condyle.**

shown as mean and standard deviation, and non-normally distributed data are shown as median and minimum-maximum values. The student's t-test evaluated the patients' pre-and postoperative clinical scores. The Friedman test was used to compare the clinical scores. A $p < 0.05$ was accepted as statistically significant.

RESULTS

Of the 47 patients included in the study, 40 (85.1%) were female, and 7 (14.9%) were male. The mean age was 57.6 ± 6.8 years, and the median value was 57 (min: 42-max: 72). The median value of the body mass index was determined as 28 (min: 24-max: 38) (Table 1). The mean follow-up time was 32 (min: 24-max: 60) months. Patients lost to follow-up were excluded.

A statistically significant difference was found between the preoperative VAS scores of the patients and the postoperative 3rd, 6th, 12th, and 24th months ($p < 0.001$). When the VAS scores between the 3rd month and 6th, 12th, and 24th months postoperatively were compared, a statistically significant difference was observed. Again, the difference between the VAS scores at the 6th and 24th months postoperatively was statistically significant (Tables 2 and 3). When male and female patients were examined separately, there was a statistically significant difference between the preoperative VAS scores and the postoperative VAS scores of the female patients. However, no statistically significant difference was observed between the preoperative VAS scores and the postoperative 3rd and 6th month VAS scores of the male patients ($p = 1.000 – p = 0180$). However, a significant difference was ob-

Table 1. Demographic characteristics of the patients

	Total n = 47	Group A n = 17	Group B n = 30	*p* value
Age (years)	57.57 ± 6.82 (42-72)	55.88 ± 5.66 (46-67)	58.53 ± 7.32 (42-72)	0.2040
Height (m)	1.65 ± 0.64 (1.50-1.84)	1.64 ± 0.71 (1.50-1.82)	1.66 ± 0.67 (1.56-1.84)	0.2343
Weight (kg)	79.70 ± 8.91 (59-106)	79.33 ± 9.02 (60-105)	79.94 ± 8.88 (59-106)	0.6786
BMI (kg/m^2)	29.08 ± 3.2) (23.63-37.50)	28.65 ± 2.52 (23.63-32.87)	29.32 ± 3.65 (23.94-37.50)	0.5100

Data are shown as mean ± standard deviation or (minimum-maximum). BMI =body mass index

Table 2. VAS, Lysholm, and WOMET scores in preoperative and postoperative periods

	VAS	LYSHOLM	VOMET
Preoperative	8.34 ± 1.20 8 (6-10)	26.17 ± 6.27 26 (14-38)	1153.62 ± 129.26 (730-1390)
Postopoperative 3rd month	5.00 ± (2.35) 5.0 (0-10)	68.87 ± (12.04) 71 (41-100)	591.62 ± 1250.19 (40-1080)
Postopoperative 6th month	3.26 ± 2.19 3 (0-10)	81.49 ± 12.71 84 (47-100)	360.0 ± 235.77 (20-1060)
Postopoperative 12th month	2.04 ± 2.33 1 (0-10)	86.89 ± 11.06 90 (42-100)	280.0 ± 223.10 (10-1085)
Postopoperative 24th month	1.26 ± 2.17 0 (0-10)	85.85 ± 11.04 91 (42-100)	200.0 ± 138.95 (0-1095)

Data are shown as mean ± standard deviation or median (minimum-maximum). VAS = Visual Analog Scale, LYSHOLM = Knee Scoring Scale, VOMET = Western Ontario Meniscal Evaluation Tool

Table 3. Statistical analysis of VAS, LYSHOLM, and WOMET scores in preoperative and postoperative periods

	Preoperative	Postoperative 3rd month	Postoperative 6th month	Postoperative 12th month
	p value	*p* value	*p* value	*p* value
Preoperative				
VAS	-			
LYSHOLM				
WOMET				
Postoperative 3rd month				
VAS	**0.004**	-		
LYSHOLM	**0.006**			
WOMET	**0.002**			
Postop 6th month				
VAS	**< 0.001**	**0.037**	-	
LYSHOLM	**< 0.001**	**0.003**		
WOMET	**< 0.001**	0.061		
Postoperative 12th month				
VAS	**< 0.001**	**< 0.001**	0.100	-
LYSHOLM	**< 0.001**	**< 0.001**	0.068	
WOMET	**< 0.001**	**< 0.001**	0.075	
Postoperative 24th month				
VAS	**< 0.001**	**< 0.001**	**0.001**	1.000
LYSHOLM	**< 0.001**	**< 0.001**	0.061	1.000
WOMET	**< 0.001**	**< 0.001**	0.189	0.189

VAS = Visual Analog Scale, LYSHOLM = Knee Scoring Scale, VOMET = Western Ontario Meniscal Evaluation Tool

served between the 3rd month and 12th and 24th month scores ($p < 0.05$) (Table 4).

When the Lysholm scores of the patients were compared, a statistically significant difference was found between the preoperative Lysholm knee scores and the values in the postoperative follow-ups (Tables 2 and 3). A significant difference was found between the preoperative period and the postoperative period in WOMET scores, in which we evaluated both the physical activities and return to sports and the emotional state of our patients. When we evaluated the postoperative follow-ups among themselves, no statistically significant difference was found between the postoperative 3rd and 6th months, 6th and 12th months, and postoperative 12th and 24th months (Tables 2 and 3).

When the correlation between the BMI values of the patients and the preoperative VAS values was examined, it was observed that there was a positive correlation (r: 0.426, $p = 0.003$). Since the correlation between VAS values and BMI values in the postoperative follow-ups was examined, a positive correlation was observed at the 3rd month (r: 0.304, $p = 0.038$), but there was no correlation between the VAS values in the remaining follow-ups. When the BMI values of the patients were compared with the postoperative Lysholm knee scores, a negative correlation was found between the postoperative 6th month Lysholm knee score ($r = -0.313$, $p = 0.032$). No relationship was observed in the postoperative 3rd, 12th, and 24th month follow-ups. No statistical correlation was found between the BMI values of the patients and the WOMET

Table 4. The mean-median values of VAS scores of male and female patients

Gender	Preoperative VAS	Postoperative 3rd month VAS	Postoperative 6th month VAS	Postoperative 12th month VAS	Postoperative 24th month VAS
Female	8.30-8.00	4.85-5.00	3.27-3.00	2.13-1.50	1.38-1.00
Male	8.57-8.00	5.86-5.00	3.14-3.00	1.57-1.00	0.57-1.00
Total	8.34-8.00	5.00-5.00	3.26-3.00	2.04-1.00	1.26-1.00

scores evaluated in the preoperative or postoperative follow-ups.

The patients who underwent surgery were grouped as those who underwent osteophyte debridement (Group A, n = 17) and those who did not (Group B, n = 30), and comparisons were made in the same way. According to the results of this study sensitivity of the MRI is 100% for the presence of osteophytes underneath the AIL; 17 patients in Group A, has osteophytes seen in MRI and proved by arthroscopy. Also, the 30 patient in Group B no osteophytes in MRI or arthroscopy.

In patients included in Group A, preoperative VAS score was 8.12 (min: 6-max: 10), postoperative 3rd

Table 5. Preoperative and postoperative VAS, LYSHOLM, and WOMET scores and extention angle of patients with osteophytes (+) and osteophytes (-)

	Group A	Group B	*p* value
Preoperative			
VAS	8.12 (6-10)	8.47 (7-10)	0.3425
LYSHOLM	25.41 (14-38)	26.6 (16-38)	0.6256
WOMET	1173.53 (980-1290)	1145.67 (730-1380)	0.5872
Extention angle (^{0})	4.71 ± 5.14	3.50 ± 4.58	0.4296
Postoperative 3rd month			
VAS	4.59 (0-10)	5.23 (0-10)	0.2053
LYSHOLM	67.71 (41-95)	71.37 (41-100)	0.2677
WOMET	623.24 (290-1080)	577.50 (40-1080)	0.7147
Postop 6th month			
VAS	3.29 (0-10)	3.23(0-10)	0.9372
LYSHOLM	79.29 (47-95)	83.50(47-100)	0.4780
WOMET	477.65 (130-1060)	408.65 (20-1050)	0.7987
Postoperative 12th month			
VAS	2.18(0-9)	1.97 (0-10)	0.5941
LYSHOLM	85.18(54-95)	88.23 (42-100)	0.2183
WOMET	380.0 (45-1085)	311.67 (10.1050)	0.6178
Postoperative 24th month			
VAS	1.12 (0-9)	1.33(0-10)	0.7532
LYSHOLM	87.76 (54-99)	88.13(42-100)	0.7985
WOMET	316.47 (0-1095)	261.5(10-1050)	0.9118
Extention angle (^{0})	-9.71 ± 1.21	-0.17 ± 3.07	**< 0.0001**

Data are shown as mean ± standard deviation or median (minimum-maximum). VAS = Visual Analog Scale, LYSHOLM = Knee Scoring Scale, VOMET = Western Ontario Meniscal Evaluation Tool month of 4.59 (min: 0-max: 10), postoperative 6thmonth of 3.29 (min: 0-max: 10), postoperative 12thmonth of 2.18 (min: 0-max: 9), postoperative 24thmonth of 1.12 (min: 0-max: 9). The mean value of the preoperative VAS score of the patients included in Group B was 8.47 (min: 7-max: 10), the mean value of the postoperative 3rd month was 5.23 (min: 0-max: 10), the postoperative 6th month mean value was 3.32 (min: 0-max: 10), postoperative 12th month mean value was 1.127 (min: 0-max: 10), postoperative 24th month mean value was 1.33 (min: 0- max: 10). When these two groups were compared, no statistically significant difference was found between preoperative, postoperative 3rd month, 6th month, 12th month, and 24th month VAS, Lysholm, and WOMET scores (Table 5).

Mean preoperative extension angle was 3.94 ± 4.77. It was 4.71 ± 5.14 for group A and 3.50 ± 4.58 for group B without significant difference (p = 0.4296). Mean postoperative extension angle was -3.62 ± 5.29. It was -9.71 ± 1.21 for group A and -0.17 ± 3.07 for group B with a significant difference ($p <$ 0.001).

DISCUSSION

A statistically significant difference was found between the patients' preoperative VAS, Lysholm, and WOMET scores and the postoperative 3rd, 6th, 12th, and 24th month results. However, no statistically significant difference was found between the 6th, 12th, and 24th month values. While there was no significant difference in functional scores between the two groups, separated according to the presence of osteophytes beneath the AIL, a significant difference was found when the postoperative range of motion was examined.

In the treatment of degenerative meniscal tears, meniscectomy, which has been frequently applied in previous years, has started to leave its place to conservative treatment methods with the realization of the critical role of menisci in joint stability [10, 11]. Many studies have shown that long-term follow-up results after meniscectomy cause an increase in the development of osteoarthritis, and it does not have a significant advantage over conservative treatment. Li *et al*. [12] compared pain and function results at 12th month and 24th month in patients with degenerative meniscus treated with arthroscopic partial menisectomy (APM) and physical therapy alone. Although patients with APM at 12th month were better, they did not find a significant difference between the two groups in their results at 24th month. This was thought to be because the later onset of osteoarthritic changes suppressed the significant benefits in the short term.

APM, which was frequently applied in previous years, has now started to give way to conservative treatment. In 2016, ESSKA (European Society of Sports Traumatology, Knee Surgery and Arthroscopy) recommended that APM be removed from being the primary treatment for degenerative meniscal lesions, with the "Meniscus Consensus Project" report, in which 84 surgeons and scientists contributed [13]. According to this report, it has been stated that APM can be recommended to patients who have pain and mechanical symptoms after three months of conservative treatment, have normal X-ray findings and have grade 3 meniscus lesions on MRI. It has been reported that early surgery can be recommended in patients with obvious mechanical symptoms or severe osteoarthritis findings on X-rays [13].

Osteophytes are accepted as one of the radiological diagnostic markers of knee osteoarthritis [14]. Osteophytes are abnormal bone spurs around the joint and are frequently seen in middle-aged and older people. Unlike previous studies, we divided the patients who underwent surgery into those with and without osteophytes beneath the AIL in MRI. In 17 of 47 patients who were operated, osteophyte debridement was also performed due to the presence of osteophytes beneath the AIL in MRI. When the postoperative VAS, Lysholm, and WOMET scores of the patients who underwent osteophyte debridement were compared with the other group, no statistically significant difference was observed. When the postoperative joint range of motion was compared, a statistically significant difference was found in favor of those who underwent debridement. Felson *et al*. [14] showed that osteophytes formed in the knee joint restricted the free movement of the femur on the tibia. As a result of our study, although we accept that conservative treatment is the primary treatment method in the general population in patients with degenerative meniscal tears, we think that osteophyte debridement should be performed in patients with osteophytes on MRI. It may provide a higher postoperative clinical outcome and a better range of motion.

We suggest that patients with degenerative meniscal tears should be evaluated preoperatively for the presence of osteophytes on MRI. The ESSKA report suggests that conservative treatments should be preferred in patients whose osteophytes are not detected in preoperative MRI. Current treatments have begun to focus on preserving these tissues as much as possible, considering the role of menisci in joint stability. Various studies have shown that even partial meniscectomy is insufficient to protect the joint.

Limitations

There are several limitations of our study. Our retrospective study shows the follow-up results of patients with APM who were operated on between 2017-2018. Considering that meniscectomy is no longer the primary treatment, more objective results can be obtained with a prospective study in which patients treated with nonoperative methods and undergoing only osteophyte debridement are examined. Another limitation of our study is that it had a small sample of 47 patients

CONCLUSION

We think that osteophyte debridement, which will be applied without meniscectomy in patients with osteophytes detected in MRI, can preserve meniscus functions as much as possible and contribute positively to the postoperative healing process.

Authors' Contribution

Study Conception: EAÖ; Study Design: EAÖ, RA; Supervision: MOK, RA; Funding: N/A; Materials: EAÖ, MOK; Data Collection and/or Processing: MCG; Statistical Analysis and/or Data Interpretation: MCG, MK; Literature Review: MCG, MK; Manuscript Preparation: MCG, EAÖ, MOK and Critical Review: RA, EAÖ.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

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