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Evaluation of the association of ligamentum mucosum with anterior knee pain and the effect of ligamentum mucosum excision due to femoral attachment on arthroscopic surgery time

Ligamentum mukozumun diz önü ağrısı ile ilişkisi ve ligamentum mukozumun femoral tutunma yerinden eksizyonunun artroskopik cerrahi süresine etkisi

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ABSTRACT

Aim: The main purpose of the study was to determine the duration of excisions made from the femoral attachment of the ligamentum mucosum during knee arthroscopy and the duration of excision from the portion attached to the retropatellar fat pad and evaluate which anatomic area excision shortens the surgical time. The second purpose of this study was to determine whether the excision of ligamentum mucosum has an effect on anterior knee pain with age.

Materials and methods: 64 patients were included in this retrospective study. Patients were assigned into two groups based on the ligamentum mucosum excision technique, and ligamentum mucosum excision times were calculated. Ligamentum mucosum excision was performed from the femoral attachment site in 34 and retropatellar fat pad attachment in 30 patients. Patients were divided into two groups younger or older than 40 years of age, regardless of the excision technique. All patients were evaluated with Kujala scores.

Results: Mean excision time of ligamentum mucosum was found to be 17.4 ±3.4 s in group excision from the femoral intercondylar node and the mean excision time was found to be 49 ±10.7 s from retropatellar fat pad attachment region. The mean Kujala score in the >40-year-old group was 84.8 ±6.4, and in the <40-year-old group was 94 ±5.5.

Conclusion: Excision made from the intercondylar node can shorten the surgical time relative to that of the excision made from the retropatellar fat pad. Clinical results of patients <40 years of age were better than those of patients aged >40 years of age.

Keywords: Anterior knee pain, knee, ligamentum mucosum.

ÖZ

Amaç: *Çalışmanın ilk amacı, diz artroskopisi sırasında ligamentum mukozasının femoral yapışma yerinden yapılan eksizyonların süresini ve retropatellar yağ yastıkçığına bağlı kısımdan yapılan eksizyon süresini belirlemek ve hangi anatomik alan eksizyonunun ameliyat süresini kısalttığını belirlemektir. Bu çalışmanın ikinci amacı, yaşla birlikte diz önü ağrısı üzerine ligamentum mukozum eksizyonunun etkisi olup olmadığını belirlemektir.*

Gereç ve Yöntem: *Bu retrospektif çalışmaya 64 hasta dahil edildi. Hastalar ligamentum mukozum eksizyon tekniğine göre iki gruba ayrıldı. Ligamentum mukozum eksizyon süreleri hesaplandı. Hastaların 34'ünde femoral yapışma bölgesinden ligamentum mukozom eksizyonu ve 30'unda retropatellar yağ yastıkçığı yapışma bölgesinden eksizyon yapıldı. Hastalar eksizyon tekniğinden bağımsız olarak 40 yaş altı veya 40 yaş üstü olmak üzere iki gruba ayrıldı. Tüm hastalar Kujala skorları ile değerlendirildi.*

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Bulgular: *Femoral interkondiler alandan yapılan ligamentum mukozum eksizyonunun ortalama süresi 17,4 ±3,4 sn ve retropatellar bölgeden yapılan ortalama eksizyon süresi 49 ±10,7 sn olarak bulundu. >40 yaş grubunda ortalama Kujala skoru 84,8 ±6,4, <40 yaş grubunda ise 94 ±5,5 olarak tespit edildi.*

Sonuç: *İnterkondiler alandan yapılan eksizyon, retropatellar yağ yastıkçığından yapılan eksizyona göre cerrahi süreyi kısaltabilir. 40 yaş <hastaların klinik sonuçları >40 yaş hastalara göre daha iyidir.*

Anahtar Sözcükler: *Diz, ligamentum mukozum, ön diz ağrısı.*

INTRODUCTION

The ligamentum mucosum (LM) is the remnant of the membrane that divides the knee embryonically (1). Histological examinations of the LM revealed nerve endings at the attachment point of the retropatellar fat pad that played a role in the kinematics of the knee extensor mechanism (2).

LM was excised before arthroscopic visualization of the lateral compartment during standard knee arthroscopy. After visualization of the lateral femoral condyle, arthroscopic visualization of the lateral compartment was performed. An important factor that prolongs the surgical time during knee arthroscopy is the location of the LM anterior to the anterior cruciate ligament. LM is a ligamentous structure that originates from the synovial layer of the knee joint. It starts from the intercondylar area of the femur and ends at the center of the intrapatellar fat pad (3). LM has been detected in the knee at the rate of 79.2%, and its isolation from the anterior cruciate ligament occurs at the rate of 92.7% (4). Another cadaveric study revealed that the LM was detected in the knee at the rate of 83% (5).

In knee arthroscopy, after examining the medial and lateral gutters of the patellofemoral joint in knee extension, the knee was flexed to 90 degrees. If the evaluation of the medial tibiofemoral joint and the medial meniscus indicated an LM, excision of the LM was performed from the medial to the lateral end, usually with a shaver, until the lateral femoral condyle entered the imaged area. When the knee was flexed by 30–45 degrees, the femoral attachment of the LM was very well visualized. In this situation, where the LM was the loosest at this knee flexion angle (6).

Paciniani corpuscles are located inside the intrapatellar fat pad; these nerve endings provide pressure perception. It helps the proprioceptive property of the infrapatellar fat pad (7). It is believed that the retropatellar fat pad is effective in the flexion and extension of the knee with the menisci. Moreover, it has been stated that fibrosis in the retropatellar fat pad after knee surgeries may limit knee movements, especially in extension (5). The LM restricts the movement of the retropatellar fat pad in the anterior direction (8). After excision of the LM, the retropatellar fat pad moves anteriorly due to the increase in the pressure with the intra-articular fluid and does not prevent the arthroscopic view, which reduces the need for retropatellar fat pad resection (9).

The main purpose of the study was to determine the duration of excisions made from the femoral attachment of the LM during knee arthroscopy and the duration of excision from the portion attached to the retropatellar fat pad and evaluate which anatomic area excision shortens the surgical time. The second aim of this study was to determine whether the excision of ligamentum mucosum has an effect on anterior knee pain with age.

The hypothesis of this study is to determine whether ligamentum mucosal excision sites shorten the surgical time and to determine the relationship between ligamentum mucosum and anterior knee pain.

MATERIALS and METHODS

Study design

The research was approved by the institutional review board (IRB) of the authors and conducted in accordance with the Declaration of Helsinki. Informed written consent was obtained from all patients who participated in this study.

In this study, patients who underwent knee arthroscopy for various intra-knee pathologies at our clinic during 2018–2020 were retrospectively evaluated. Patients aged 18–60 years, with Kujala scores in their follow-up files and a follow-up period of at least 12 months were included in the study (10). Patients aged <18 years and >60 years, with a follow-up period of <12 months, and without Kujala scores in their follow-up files were not included in the study. Patients who had a meniscal tear, anterior cruciate ligament tear, and osteochondral lesions were not included in the study. In all, 286 knee arthroscopies were

performed in our clinic during these 3 years; the examination of these patients' files showed that LM was detected during the arthroscopic surgeries of 182 patients. Among these 182 patients, 64 patients with chronic anterior knee pain did not show meniscal tear, anterior cruciate ligament tear, or osteochondral lesion, but their LM was excised. The records of these 64 patients during arthroscopy were reviewed, and the patients were assigned into two groups based on the ligamentum mucous excision technique used, and the LM excision times were calculated. It was determined that the LM excision was performed from the femoral attachment site in 34 of the 64 patients and the retropatellar fat pad attachment in 30 patients. LM excision times were determined and calculated as the time between the initiation of debridement with a shaver or a punch to the appearance of the lateral femoral condyle.

Surgical technique

Arthroscopic LM excision methods

All surgeries were performed under a tourniquet after cefazolin sodium prophylaxis 1 hour before induction of anesthesia. During the surgery, while the patients were still lying in the supine position, a silicone riser pad was placed under both their knees and the knees were left free to remain in 90° flexion. After diagnostic arthroscopy was completed using the standard anterolateral portal, the anteromedial working portal. The LM was detected and excised from the femoral attachment or the attachment of the retropatellar fat pad.

Excision from the femoral attachment

After detecting the LM, the knee was flexed at 30°–45° and the LM was excised with a shaver from the femoral attachment area. (Figure-1-2)

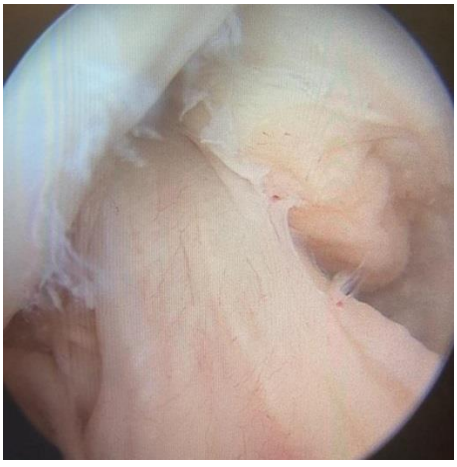

Figure-1. Arthroscopic view of the ligamentum mucosum in the intercondylar area

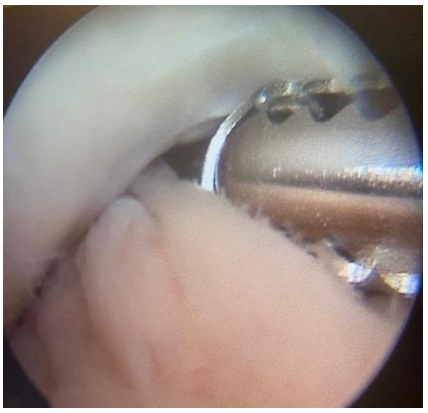

Figure-2. Appearance of anterior cruciate ligament after arthroscopic ligamentum mucous excision

Excision from the retropatellar fat pad attachment

After detecting the medial femoral condyle, the LM was excised with a shaver, starting from the medial side of the attachment of the LM to the retropatellar fat pad to the lateral side at 90° knee flexion.

Evaluation of patients

The age, follow-up period, and Kujala scores in the medical files of the patients included in this study were determined. The LM excision times and excision techniques were determined from the arthroscopic records of the patients, and the patients were accordingly divided into two groups. To evaluate the efficacy of age on clinical outcomes, since the age of 40 is the beginning of the middle age group, the patients were divided into two groups younger or older than 40 years of age, regardless of the excision technique used.

Statistical analysis

The suitability of the data for normal distribution was tested; since they were not normally distributed, the non-parametric Mann–Whitney U-test was applied to compare the numerical variables, and the Chi-square-Fisher Exact test was used for categorical data. A p-value of <0.05 at the 95% confidence interval was considered to indicate statistical significance.

RESULTS

In this study, 64 patients met the criteria of the study and were followed up. Of these, 34 patients were men and 30 were women. The mean age of these patients was 39 ±12.2 years. The mean follow-up period of the patients was 18.6 ±3.2 months. The mean Kujala scores at the last

follow-up of the patients were determined to be 90.2 ±7.4. The mean time to excision of the LM was 32.2 ±17.6 s.

The mean age of the patients in the group who underwent excision of the LM from the femoral intercondylar node was 38.3 ±12.2 years. In this group, the follow-up period was determined to be 18.3 ±3 months, and the mean Kujala score was 91.2 ±7.2. The mean excision time of LM was found to be 17.4 ±3.4 s in this group. There were 34 patients in this group.

The mean age of the patients was 39.8 ±12.4 years in the group that underwent LM excision from the retropatellar fat pad attachment region. The follow-up period was determined to be 19 ±3.4 months. The mean Kujala score was 89.2 ±7.6. In this group, the excision time of the LM was determined as 49 ±10.7 s. There were 30 patients in this group. (Table-1)

Statistical comparison of the results of both groups demonstrated a statistically significant difference between the Kujala scores ($p \leq 0.05$). No statistically significant difference was detected between the follow-up periods and the age values of the patients. A statistically significant difference was detected between the surgical times ($p \leq 0.05$). Excisions of the LM from the femoral intercondylar region were performed in a shorter time than the excision of the LM from the retropatellar fat pad attachments.

When the clinical results were evaluated by dividing the patients into 2 groups of patients aged <40 years and those aged >40 years, independent of the LM excision technique used. It was determined that there were 38 patients under the age of 40 years and 26 patients above the age of 40 years. The mean Kujala score in the >40-year-old group was 84.8 ±6.4, and the mean Kujala score in the <40-year-old group was 94 ±5.5. As a result of the statistical evaluation by age, a statistically significant difference was noted between the Kujala questions of the groups under 40 and those over the age of 40 years ($p \leq 0.05$). The Kujala scores of patients <40 years of age were better than those of patients >40 years of age (Table-2).

Table-1. Demographic data and the clinical results of the study groups according to ligamentum mucosum excision site.

	Number of patients	Mean age (year)	Follow-up time (month)	Mean Kujala score	Mean surgical excision time (s)
Group with excision from the intercondylar node	34	38,3 ±12,2	18,3 ±3	91,2 ±7,2	17,4 ±3,4
Group excision from retropatellar fed pad	30	39,8 ±12,4	19 ±3,4	89,2 ±7,6	49 ±10,7
P value	p≥0,05	p≥0,05	p≥0,05	p≥0,05	p≤0,05

Table-2. Clinical results of the groups according to age.

	Number of patients	Mean Kujala scores
Patients under age 40 years	38	94±5,5
Patients over age 40 years	26	84,8 ±6,4
P value	p≤0,05	p≤0,05

DISCUSSION

The main findings of this study are; Excisions of the LM from the femoral intercondylar region were performed in a shorter time than the excision of the LM from the retropatellar fat pad attachments and LM excision is effective in reducing anterior knee pain in patients under 40 years of age.

It has been suggested that nociceptive nerve endings of the infrapatellar pad are associated with anterior knee pain. Some studies have suggested that LM may cause anterior knee pain. LM and retropatellar fat pad act in combination as enthesis organs (5). When there is tension in the LM and retropatellar fat pad, pain may develop with the nociceptive nerve pathway, leading to anterior knee pain (11). Although it is believed that anterior knee pain and scores may be lower due to damage to the proprioceptive cells in the retropatellar fat pad in LM excisions made from the retropatellar fat pad, no statistically significant

difference was detected between the clinical outcomes of the two groups.

LM starting from the intercondular node of the femur and ending in the superior proximal of the retropatellar fat pad was classified as abnormal LM. It was found that patients with this type of LM had greater osteochondropathy in the superior intercondular node of the femur and patellofemoral sulcus (12). Moreover, the clinical results of 11 out of 12 patients who underwent LM excision with the complaint of isolated anterior knee pain were found to be good (3). Furthermore, Kujala scores and clinical results in the last control of our patients who underwent LM excision were evaluated as good.

There are no clinical studies on isolated infrapatellar fat pad excision yet. Some studies have been conducted during anterior cruciate ligament reconstructions. In the examination of patients who underwent anterior cruciate ligament reconstruction and underwent opening of the anterior portal, patellar tendinitis was detected in 72% of patients; secondary look arthroscopy was performed in 5.4% of the patients, fibrosis was detected in the infrapatellar fat pad, and LM hypertrophy was detected in 12.5% of the patients. It is stated that it causes fibrosis and hypertrophy in the anterior compartment (13). In another study, it was found that partial resection of the infrapatellar fat pad in patients who underwent anterior cruciate ligament reconstruction did not affect the knee scores and clinical outcomes of the patients (14). As a result of the studies performed during anterior cruciate ligament reconstructions, excision of the retropatellar fat pad was not very effective on the clinical outcomes. In our study, no statistically significant difference was detected between the clinical outcomes of the group in whom the retropatellar fat pad of the LM excision was performed and the group performed by the intercondylar node. In the group where excision was made by the retropatellar fat pad; partial excision occurred in the retropatellar fat pad. The absence of a statistically significant difference between the clinical outcomes between the groups suggests that the excision of the retropatellar fat pad did not affect the clinical outcomes.

There is no study in the literature on the relationship between LM excision and age. According to the results of our study, a statistically significant difference exists between the clinical results after excision of the LM in patients <40 years of age and those after LM excisions in patients >40 years of age. This finding suggests that age is an important factor in anterior knee pain, except for LM excision. We believe that this relationship can be better determined by conducting prospective randomized studies on this subject.

The middle lobe of the infrapatellar fat pad is connected to the intercondylar node with the LM. In this way, when the knee is extended, it aligns with the intercondylar node (15). The volume of the infrapatellar fat pad decreases with a decrease in the intra-articular knee volume in terminal flexion and extension (16). The LM, which attaches to the middle lobe of the infrapatellar fat pad, acts as a ligament that pulls the infrapatellar fat pad from the top when the knee is extended (15). It was determined that the tension of the LM increased when the knee reached the forward flexion degree and that the tension was the least at the intermediate flexion degrees (6). Moreover, the best visualization of the LM with arthroscopy in the intercondylar node excisions of the LM was the intermediate flexion degrees of the knee, and it was compatible with the biomechanical and anatomical features described in the literature. Excisions of the LM from the femoral intercondylar region can be performed in a shorter time compared to excision from the retropatellar fat pad attachments.

CONCLUSION

Excision made from the intercondylar node can shorten the surgical time relative to that of the excision made from the retropatellar fat pad. Clinical results of the patients <40 years of age were better than those of patients aged >40 years of age.

Conflict of interest: The authors declare that they have no conflict of interest.

References

1. Hardaker WT, Whipple TL, Bassett FH 3rd. (1980). Diagnosis and treatment of the plica syndrome of the knee. J Bone Joint Surg Am. 62 (2):221-5.
2. Norris M, Corbo G, Banga K, Johnson M, Sandig M, Smallman T, Getgood A, Burkhart TA. (2018). The biomechanical and morphological characteristics of the ligamentum mucosum and its potential role in anterior knee pain. Knee. 25 (6):1134-41. https://doi.org/ 10.1016/j.knee.2018.08.017
3. Boyd CR, Eakin C, Matheson GO. (2005) Infrapatellar plica as a cause of anterior knee pain. Clin J Sport Med. 15 (2):98-103. https://doi.org/ 10.1097/01.jsm.0000152706.43395.68
4. Brooker B, Morris H, Brukner P, Mazen F, Bunn J. (2009) The macroscopic arthroscopic anatomy of the infrapatellar fat pad. Arthroscopy. 25 (8):839-45. https://doi.org/ 10.1016/j.arthro.2009.01.020.
5. Smallman T, Shekitka K, Mann K, Race A. (2015) The infrapatellar plica A new non-isometric intra-articular ligament of the knee. FASEB J. 29:545.3 (suppl).
6. Smallman TV, Portner OT, Race A, Shekitka K, Mann K. (2018) Arthroscopic Untethering of the Fat Pad of the Knee: Release or Resection of the Infrapatellar Plica (Ligamentum Mucosum) and Related Structures for Anterior Knee Pain. Arthrosc Tech. 7 (5):575-88. https://doi.org/ 10.1016/j.eats.2018.02.002.
7. Krenn V, Hofmann S, Engel A. (1990) First description of mechanoreceptors in the corpus adiposum infrapatellare of man. Acta Anat (Basel). 137 (2) :187-8. https://doi.org/ 10.1159/000146883.
8. Bohnsack M, Wilharm A, Hurschler C, Rühmann O, Stukenborg-Colsman C, Wirth CJ. (2004) Biomechanical and kinematic influences of a total infrapatellar fat pad resection on the knee. Am J Sports Med. 32(8):1873-80. https://doi.org/ 10.1177/0363546504263946.
9. Sonnery-Cottet B, Archbold P, Zayni R, Thaunat M, Bortolletto J, Fayard JM, Chambat P. (2011) High lateral portal for sparing the infrapatellar fat-pad during ACL reconstruction. Orthop Traumatol Surg Res. 97(8):870-3. https://doi.org/ 10.1016/j.otsr.2011.08.007
10. Kuru T, Dereli EE, Yaliman A. (2010) Validity of the Turkish version of the Kujala patellofemoral score in patellofemoral pain syndrome. Acta Orthop Traumatol Turc. 44(2):152-6. https://doi.org/ 10.3944/AOTT.2010.2252.
11. Smallman TV, Race A, Ekroth S. (2012) Intra-operative visualization of deformation of the infrapatellar plica (IPP), and fat pad The link to anterior knee pain. J Bone Joint Surg Br 94:100 (suppl XXXVIII).
12. Ozcan M, Copuroğlu C, Ciftdemir M, Turan FN, Calpur OU. (2011) Does an abnormal infrapatellar plica increase the risk of chondral damage in the knee. Knee Surg Sports Traumatol Arthrosc.19(2):218-21. https://doi.org/ 10.1007/s00167-010-1273-3.
13. Goto K, Taketomi S, Shimizu N. (2020) Central patellar portal placement frequently provokes anterior knee compartment radiological abnormalities in anterior cruciate ligament reconstruction. Knee Surg Sports Traumatol Arthrosc. 28 (7) :2255-60. https://doi.org/10.1007/s00167-019-05817-4
14. Asai K, Nakase J, Oshima T, Shimozaki K, Yoshimizu R, Tsuchiya H. (2020) Partial resection of the infrapatellar fat pad during anterior cruciate ligament reconstruction has no effect on clinical outcomes including anterior knee pain. Arch Orthop Trauma Surg. 140(11):1751-7. https://doi.org/10.1007/s00402-020-03520-5.
15. Stephen JM, Sopher R, Tullie S, Amis AA, Ball S, Williams A. (2018) The infrapatellar fat pad is a dynamic and mobile structure, which deforms during knee motion, and has proximal extensions which wrap around the patella. Knee Surg Sports Traumatol Arthrosc. 26(11):3515-3524. https://doi.org/ 10.1007/s00167-018-4943-1
16. Bohnsack M, Hurschler C, Demirtas T, Rühmann O, Stukenborg-Colsman C, Wirth CJ. (2005) Infrapatellar fat pad pressure and volume changes of the anterior compartment during knee motion: possible clinical consequences to the anterior knee pain syndrome. Knee Surg Sports Traumatol Arthrosc.13(2):135-141. https://doi.org/10.1007/s00167-004-0561-1.