

# Evaluation of clinical results after arthroscopic meniscus repair and partial meniscectomy

 Ali Canbay<sup>1</sup>,  Resit Sevimli<sup>2</sup>,  Gokay Gormeli<sup>3</sup>,  Yunus Oklu<sup>2</sup>,  Ekrem Ozdemir<sup>2</sup>

<sup>1</sup>Elbistan State Hospital, Clinic of Orthopaedics and Traumatology, Kahramanmaraş, Turkey

<sup>2</sup>Inonu University, Faculty of Medicine, Department of Orthopaedics and Traumatology, Malatya, Turkey

<sup>3</sup>Private Clinic

Copyright © 2020 by authors and Annals of Medical Research Publishing Inc.

## Abstract

**Aim:** The aim of our study was to evaluate the clinical results of arthroscopic repair and partial meniscectomy in the patients who had with meniscal tear.

**Material and Method:** A total of 113 patients who were admitted to our clinic for meniscal tear between 2009 and 2017 were included in our study. Sixty one patients who underwent arthroscopic meniscal repair and 52 underwent partial meniscectomy. All inside meniscal repair technique was used for all meniscal repairs. Clinical assessments included physical examination findings, Lysholm score, the IKDC score and visual analog score (VAS). Barret criteria were used for the clinical assessment of healing status.

**Results:** The patients who underwent meniscal repair, 54 (88.5%) were male 7 (11.5%) were female. The mean age was 32 (19- 45) years. Our mean follow-up period was 47 (range; 24-109) months. Number of patients underwent only meniscal repair was 29 and concurrent anterior cruciate ligament reconstruction was 32. According to the Barret's criteria's patients had 18% surgical failure. The patients who underwent partial meniscectomy 33 were male 19 were female. Our mean follow-up period was 29.5 (range; 24-101) months. Eight patients (15.4%) had surgical failure. IKDC, Lysholm and VAS scores were statistically significantly improved postoperatively both in repair and partial meniscectomy group

**Conclusion:** Meniscus repair should be performed whenever possible independent from age of patient. When repair is not possible, partial meniscectomy also have good results at least in short term follow-up.

**Keywords:** All-inside; arthroscopic meniscus repair; barretcriteria; partial meniscectomy

## INTRODUCTION

Meniscus injuries are a common problem in orthopedics. Annual incidence is reported as 60-70 knees per 100,000 (1). In the past, they were considered 'residual tissues without function' (2). Today, almost all surgeons agree that the main idea is to preserve the meniscus tissue as much as possible.

Meniscus treatment methods have changed in the historical process. Total and partial meniscectomies were performed when arthroscopy was not used yet. However, meniscectomies have been shown to cause severe joint damage in the future (3,4). With the development of arthroscopy, repair options have come to the forefront in appropriate tears. Repair options include techniques such as inside-out, inside-out and all-inside. The advantages of existing treatment methods over each other are controversial. However, the all inside suture technique has reduced the chance of vascular nerve injury

especially in treatment of posterior horn meniscal tears and the operation time has shortened thanks to the easier application of the technique (5). Partial meniscectomy is performed by preserving the meniscus tissue as much as possible in areas that are not suitable for repair and especially in areas where meniscus blood supply is low.

In our present study, we aimed to present our clinical results of meniscus injury, repairs and partial meniscectomy in non-repairable patients with the help of Lysholm, IKDC and VAS scores and literature.

## MATERIAL and METHODS

In this study, we retrospectively evaluated the patients who were admitted to our clinic for meniscal injury between 2009 and 2017.

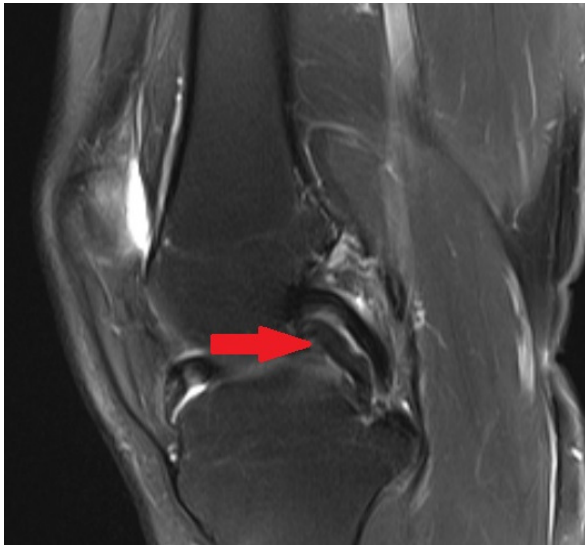
Human research ethics approval was obtained from the local review board (dated 19.10.2018 and numbered 2018 / 19-6) prior to the initiation of any study activities.

**Received:** 22.12.2019 **Accepted:** 25.02.2020 **Available online:** 23.05.2020

**Corresponding Author:** Ali Canbay, Elbistan State Hospital, Clinic of Orthopaedics and Traumatology, Kahramanmaraş, Turkey

**E-mail:** dr.alicanbay@gmail.com

From the time of admission, we obtained examination information, clinical follow-up, functional scales and video recordings from the hospital registry system and archive. Physical examination, special tests, standing lateral X-ray and MRI (Figure 1) were used routinely for diagnosis.



**Figure 1.** Double posterior cruciate ligament sign on MRI revealing bucket-handle meniscal tear

Inclusion criteria were patients arthroscopically treated for meniscal injury with/without anterior cruciate ligament injury, age between 18-45, patients who had preoperative and postoperative knee scores and physical findings and followed for at least 2 years. Exclusion criteria were patients younger than 18 and older than 45, follow-up time shorter than 2 years, and patients who had missing data in medical records.

We identified 162 patients operated for meniscal injury by multiple surgeons in our clinic. One hundred and thirteen of them who met inclusion criteria were included to our study. These patients were divided into two groups as meniscus repair and partial meniscectomy.

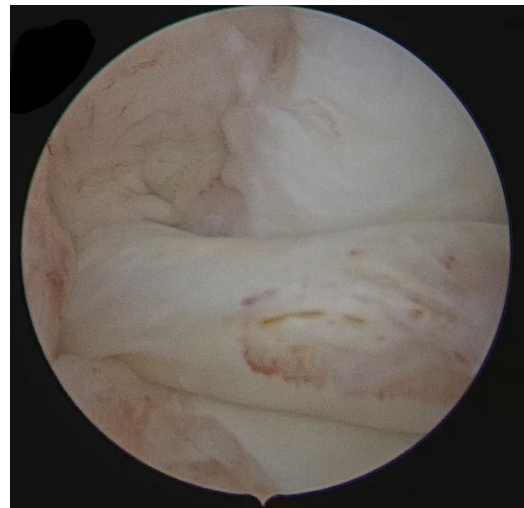
Following the selection and formation of patient groups, body mass indexes, age, gender, occupation, duration of complaints and time to surgery, whether they were subjected to trauma, return to sport (if have previous history of sport), follow-up periods, operation times, types of anesthesia, ACL reconstruction or not, shape, length, zone and location of the meniscus tear and number of sutures used to repair were evaluated.

Preoperative and postoperative International Knee Documentation Committee (IKDC) and Lysholm functional scoring were used for clinical evaluation (6-8).

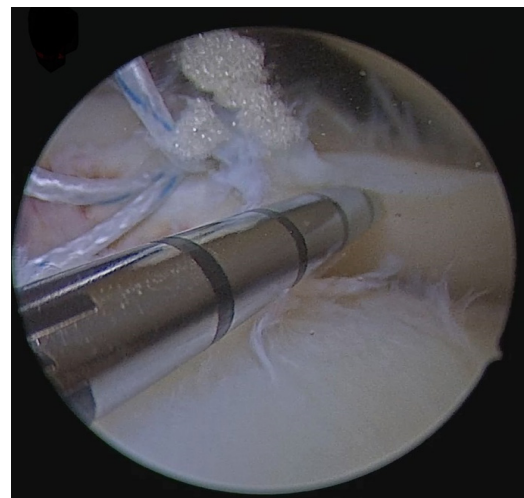
Preoperative and postoperative visual analogue scale (VAS) was evaluated. Comparison of preoperative and postoperative clinical improvement was evaluated by physical examination using the Barrett criteria (Joint line tenderness, presence of knee effusion, McMurray provocation test). The presence of at least one parameter was considered a failure.

### Surgical Technique

All of the patients were operated under spinal or general anesthesia. Using standard arthroscopic knee portals (anteromedial and anterolateral), knee was evaluated. The type of the rupture, location, stability, structure, length, and zone of meniscus tissue were determined (Figure 2). Meniscus tissues which were not suitable for repair were partially resected. The ends of the torn meniscus were debrided and rasped. The meniscus tears, which were suitable for repair, were also repaired with the all inside technique (Figure 3). Fast-fix® (Smith & Nephew, Inc. Andover, MA, USA) or RapidLoc (DePuyMitek, Raynham, MA, USA) meniscus suture kits were used for repair (Figure 1). If there was an ACL rupture, reconstruction of ACL was performed using autolog hamstring graft.



**Figure 2.** Arthroscopic view of bucket handle tear



**Figure 3.** Suturing of bucket handle meniscus after reduction

### Statistical Analysis

SPSS for Windows version 22.0 software was used for statistical evaluation of our research data. Qualitative data were presented in number (n) and percentage (%), and quantitative data were presented in median (min-max). The normal distribution of the quantitative data was determined by Kolmogorov-Smirnov test ( $p < 0.05$ ). Mann

Whitney U test was used to compare the groups in the quantitative data, and Wilcoxon test was used to examine the change (before- after) in the quantitative data. Statistical analysis of the qualitative data was performed using the Pearson chi-square test, Fisher's exact chi-square test and Monte Carlo corrected chi-square test.  $P < 0.05$  was considered statistically significant.

## RESULTS

### Findings of Repaired Cases

There were 61 patients in repair group. Right knee was affected in 33 and left knee in 28. Forty four patients had medial meniscus tear, 17 had lateral meniscus tear. ACL reconstruction was also performed in 32 patients. Thirty one (55.7%) of the patients was blue collar, 27 (44.3%) were white collar and housewife. None of our patients was professional athlete. Forty-eight of the patients were engaged in amateur sport activities (e.g football and basketball). The mean duration of return to sports was 12 months. Two of the patients described a history of trauma. Fifty-four patients (88.5%) were male and 7 (11.5%) were female. The mean age of was 32 years (range 19 to 45 years). The mean BMI was 25.5 (range; 18.20 to 31.80).

The distribution according to the type of rupture was 7 oblique, 9 horizontal, 3 radial, 27 bucket stems, and 15 longitudinal. According to the site of blood supply, RR: 35, RW: 22, WW: 4 patients. According to the location of the rupture, there were tears in the anterior root in 2 patients, in the trunk in 32 patients and in the posterior root in 27 patients. The mean number of sutures used was 2 (range 1 to 4). The tear length ranged from 10 to 35 mm.

The duration of complaints was 1 month to 120 months. The patients were operated on a mean of 12 months after their symptoms appeared. Twelve patients were operated in the acute period (before 8 weeks). The mean follow-up period was 47 (range; 24-109) months.

The mean operation time was 90 (range; 30-150) min.

All patients (100%) who had meniscus repair had at least one physical finding due to Barrett criteria before surgery. Postoperatively, this number was determined as 11 (18%); but none of them required revision surgery. The statistical analysis showed that the decrease in the number of patients with at least one physical examination findings was significant compared to the preoperative period.

When we evaluated recovery rates due to age groups (18-30 and 31-45) u Barrett criteria was used. Recovery rate was 82.6% for 18-30 age group and 83.6% for 31-45 age group. There was no statistically significant difference between the two age groups.

IKDC score improved from 21 to 96 postoperatively. Lysholm score improved from 22 to 96 postoperatively. VAS score improved from 8 to 1. All the improvement of scores was found statistically significant (Table 1).

**Table 1. Preoperative and postoperative scores of meniscus repair**

	IKDC	Lysholm	VAS
Preoperative	21	22	8
Postoperative	96	96	1
p value	0.0001	0.0001	0.0001

### Findings of Patients Undergoing Partial Meniscectomy

There were 52 patients who underwent partial meniscectomy. Right side was affected in 28 patients, left side in 24. ACL reconstruction was performed in 2 patients. Thirty three (63.5%) of the patients were male and 19 (36.5%) were female. The mean age of the 52 patients was 39 (range; 18 to 45) years. Medial meniscus was affected in 38 patients, lateral meniscus in 14. There were 26 (50 %) blue collar. Ten of the patients were engaged in sporting activities. Eleven patients had a previous trauma history. The mean BMI value was 24.15 (range; 18.30-35.40).

The distribution according to the rupture shape was 1 oblique, 4 horizontal, 39 radial, 3 bucket stems. According to the site of blood supply, RR: 0, RW: 10, WW: 42 patients. According to the location of the rupture, there were tears in the anterior root in 6 patients, in the trunk in 18 patients and in the posterior root in 28 patients. Partial meniscectomy was performed in 52 patients. The tear length ranged from 10 to 25mm.

The duration of complaints was 1 month to 120 months. The patients were operated on a mean of 12 months after their symptoms appeared. Five patients were operated in the acute period (before 8 weeks). The mean follow-up period was 29.5 (range; 24-101) months. The mean time to return to sports was 6 months. The mean operation time was 50 (range; 25-120) min.

All patients (100%) who had meniscus repair had at least one physical finding due to Barrett criteria before surgery. Postoperatively, this number was determined as 8 patients (15.4%), but none of them require additional surgery. The statistical analysis showed that the decrease in the number of patients with at least one physical examination finding was significant compared to the preoperative period.

IKDC score improved from 36 to 90 postoperatively. Lysholm score improved from 35 to 90 postoperatively. VAS score improved from 7 to 2. All the improvement of scores were found statistically significant (Table 2).

**Table 2. Preoperative and postoperative scores of partial meniscectomy**

	IKDC	Lysholm	VAS
Preoperative	36	35	7
Postoperative	90	90	2
p value	0.0001	0,0001	0.0001



## DISCUSSION

Recently, arthroscopic partial meniscectomy has become the gold standard in tears that have no chance of repair due to low cost, less complications, short hospital stay and ease of rehabilitation (9). As a matter of fact, we performed partial meniscectomy for tears that were not suitable for repair. Significant changes in IKDC, Lysholm, Barretht and VAS scores of the patients indicate the clinical satisfaction of the patients.

According to the literature, arthritic changes on radiographs of patients undergoing partial meniscectomy were significant, but there were no correlation with clinical functional results (10,11). In other words, the reflection of radiological changes to the clinic may not be one-to-one or simultaneous. In knees without any instability, good-excellent results can be achieved in 85-90% of patients after partial meniscectomy. It was reported in a study that 81% of patients who underwent partial meniscectomy with a follow-up of 10 years or more had good-excellent results (12). In our study, the safety ratio in the group undergoing partial meniscectomy was evaluated as 90% at the end of minimum 2 years follow-up.

Barretht et al. have defined joint tenderness, swelling, deadlock, and presence of Mc Murrey as simple clinical criteria for the assessment of recovery (13). We also used Barretht criteria to assess postoperative improvement of patients, because it has no cost and a noninvasive method. Miao et al. compared 3 methods (MRI, second look arthroscopy and physical examination) to assess repair success (14). Although it is a subjective method, patient history and clinical evaluation with physical examination have been considered as the gold standard in their study (14). A tear can be seen on MRI after repair and this may cause problems between the patient and the physician. Egli et al. reported that tear was reported on MR images in 24 (96%) of the 25 meniscus with successful recovery and reported that conventional MR was not safe (15). If necessary, clinical evaluation can be supported by imaging methods. The fact that MRI is noninvasive and easily accessible has increased its usability in the assessment after meniscus repair. However, edema and fibrous tissue formed during the recovery period can be perceived as pathological signal (16). Therefore, the diagnostic value of MRI in meniscus repair is controversial. In a study in which several sequences were combined, 92% sensitivity and 99% specificity were reported (14). In this study, clinical evaluation was used because second look arthroscopy was interventional and routine clinical use was limited and the diagnostic value of MRI in meniscus repair was controversial.

Lysholm scoring is a frequently used test for functional evaluation of the knee (6). Again, IKDC scoring is one of the commonly used tests (6). In our study, a significant increase was achieved in both scoring in both groups. There was also a significant decrease in the VAS scores of the patients.

In literature, no correlation was found between age and healing of the meniscus (17). In our study, we also found no difference in terms of recovery between age groups. But tears that are suitable for repair are usually seen in young people. Young, active and traumatic tears between 12 and 45 years are most suitable for repair. For this reason, we included patients aged 18 to 45 years.

The male to female ratio was 7: 1 in our study. In the literature, this ratio is specified in the range of 2.5: 1 to 4: 1 (18). This situation can be attributed to the fact that men are more prominent in social life and do more sports activities in our country. Alexander Zimmerer et al. in his study, the failure rate in women was lower than in men (19). In our study, the failure rate for males was 13%, while the failure rate for females was 57.1%, indicating a significantly lower success rate for females.

While the recovery rate of tears after trauma or sportive activity was 86%, the recovery rate of meniscus tears without any reported trauma or sportive activity was 63.6%. We think that tears that do not have a history of trauma develop on a degenerative ground and this degeneration affects healing. If we consider that the tears of women with less participation in sport activities are more atraumatic, we can explain the failure rate of women. Again, the majority of housewives women do housework while crouching up and they create serious mechanical stresses on the repaired meniscus. We think that the meniscus repaired by crouching up and doing business negatively affects the healing process.

Researchers have generally published short-term results, such as two years after surgery, in meniscus repair. Lee et al. meniscus repair in the short-term follow-up to the long-term success rates are going down and 30% of these failure rates after 2 years of follow-up that occurred in the long-term (20). In our study, the mean postoperative follow-up period of the meniscus repair patients was 47 months and this time was sufficient to evaluate recovery.

Stability is important to prevent development of knee arthritis (21). Since rupture usually occurs as a result of sportive injury, these ruptures are accompanied by ACL injuries. If the meniscus tear is accompanied by ACL injury, ACL reconstruction should be performed in same session after meniscus repair. ACL reconstruction is performed in the joint bleeding and the resulting fibrin clot as a result of the healing creates a plus effect (22,23). In addition, due to the fact that ruptures accompanying ACL rupture are frequently ruptured in the region, high healing is expected in the knees repaired in ACL (24). In studies evaluating short-term results, high recovery rates in meniscus repair were found with ACL (23,25). In the literature, success in meniscus repair and ACL reconstruction has been reported between 62-96% and in cases where meniscus repair was performed alone, the success rate is reported to be between 17-62% in short term (26-28). But in recent studies, it was emphasized that there was no difference between the meniscus repair results in knees with and without ACL tears (19,29,30).

In our study, the success rate in cases with meniscus repair with ACL reconstruction and meniscus repair only was evaluated as 81.3% and 82.8% retrospectively. There was no significant difference in terms of success and IKDC and Lysholm scores. The results of our study were also similar to the recent literature.

Our study has several limitations. The most important limitation of our study is retrospective design. Small number of patients is also a limitation. Short follow-up time is another limitation but it has been reported 2 years is enough to make clinical evaluation after meniscus surgeries. In long term, radiological changes may be seen in X-rays but as we mentioned it is not correlated with clinical results.

## CONCLUSION

We found favorable results both in meniscal repair and partial meniscectomy postoperatively compared with preoperative physical examination and clinical scores. We recommend meniscus repair whenever possible independent from age of patient. When repair is not possible, debridement also have good results at least in short term follow-up.

*Competing interests: The authors declare that they have no competing interest.*

*Financial Disclosure: There are no financial supports.*

*Ethical approval: Human research ethics approval was obtained from the local review board (Inonu University Scientific Research and Publication Ethics Committee dated 19.10.2018 and numbered 2018 / 19-6) prior to the initiation of the study activities.*

## REFERENCES

1. Matteo B D, Tarabella V, Filardo G, et al. The first meniscus repair. *Knee Surg Sports Traumatol Arthrosc* 2013; 21:1936-6
2. Scotti C, Hirschman M T, Antinof P, et al. Meniscus repair and regeneration: Review on current methods and research potential. *European Cells and Materials* 2013;26:150-70.
3. Metcalf RW, Burks RT, Metcalf MS, McGinty JB. Arthroscopic meniscectomy, in McGinty JB, Caspari RB, Jackson RW, Poehling GG editors: *Operative Arthroscopy*, ed 2. Philadelphia, PA: Lippincott-Raven, 1996, p 263-297.
4. Bonneux I, Vandekerckhove B. Arthroscopic partial lateral meniscectomy long-term results in athletes. *Acta Orthop Belg* 2002;68:356-61.
5. Lozano J, Ma CB, Cannon WD. All inside meniscus repair. *Clin Orthop Relat Res* 2006; 455:134-41.
6. Collins NJ, Misra D, Felson DT, et al. Measures of knee function: International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form, Knee Injury and Osteoarthritis Outcome Score (KOOS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Knee Outcome Survey Activities of Daily Living Scale (KOS-ADL), Lysholm Knee Scoring Scale, Oxford Knee Score (OKS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Activity Rating Scale (ARS), and Tegner Activity Score (TAS). *Arthritis Care Res.* 2011;63:208-28.
7. Celik D, Coskunsu D, Kılısoğlu OI. Lysholm and IKDC knee score translation into Turkish, cultural adaptation, validity and reliability. XI. Turkish Sports Injuries, Arthroscopy and Knee Surgery Congress, Ankara, 3-6 October 2012.
8. Lysholm J and Gillquist J. Evaluation of knee ligament surgery results with special emphasis on use of a scoring scale. *Am J S Med* 1982;10:150-4.
9. Papilla R, Del Buono A, Osti L, et al. Meniscectomy as a risk factor for knee osteoarthritis: a systematic review. *Br Med Bull* 2011; 99:89-106.
10. Andersson Molina H, Karlsson H, Rockborn P. Arthroscopic partial and total meniscectomy: A long-term follow-up study with matched controls. *Arthroscopy* 2002;18:183-9.
11. Petty CA, Lubowitz JH. Does arthroscopic partial meniscectomy always cause arthritis? *Sports Med Arthrosc* 2012;20:58-61
12. Paxton ES, Stock MV, Brophy RH. Meniscal repair versus partial meniscectomy: a systematic review comparing reoperation rates and clinical outcomes. *Arthroscopy* 2011; 27:1275-88.
13. Barrett GR, Field MH, Treacy SH, Ruff CG. Clinical results of meniscus repair in patients 40 years old older. *Arthroscopy* 1998;14:824-9.
14. Miao Y, Yu JK, Ao YF, et al. Diagnostic values of 3 methods for evaluating meniscal healing status after meniscal repair: comparison among second-look arthroscopy, clinical assessment, and magnetic resonance imaging. *Am J Sports Med* 2011;39:735-42.
15. Eggl S, Wegmüller H, Kosina J, et al. Long term results of arthroscopic meniscal repair. *Am J Sport Med* 1995;23:715-20.
16. Henning CE, Lynch MA, Yearout KM, et al. Arthroscopic meniscal repair using in xogenous fibrin clot. *Clin Orthop* 1990; 252:64-72.
17. Scott GA, Jolly BL, Henning CE. Combined posterior incision and arthroscopic intra-articular repair of the meniscus. An examination of factors affecting healing. *J Bone Joint Surg Am.* 1986;68:847-61.
18. Maffulli N, Longo UG, Campi S, Denaro V2. Meniscal tears. *Open Access J Sports Med* 2010;1:45-54.
19. Alexander Zimmerer, Christian Sobau, Rainer Nietschke, et al. Long-term outcome after all inside meniscal repair using the Fast-Fixsystem. *J Orthop* 2018;15:602-5.
20. Lee GP, Diduch DR. Deteriorating outcomes after meniscal repair using the Meniscus Arrow in knees undergoing concurrent anterior cruciate ligament reconstruction: increased failure rate with long-term

- follow-up. Am J Sports Med 2005;33:1138-41.
21. Aslantürk O, Ergen E, Yılmaz O, et al. Clinical results of anterior cruciate ligament reconstruction with bone-patellartendon-bone autograft: A prospective study. Ann Med Res 2018;25:218-2.1
  22. Cannon WD Jr. Arthroscopic meniscal repair. Inside-out technique and results. Am J Knee Surg 1996;3:137-43.
  23. Paulos LE. Meniscus: Structure, function, injury, repair. Arthroscopy Association of North America, 1997 Speciality Day Meeting San Francisco USA. 1997:164-9.
  24. Morgan CD, Wojtys EM, Casscells CD, Casscells SW. Arthroscopic meniscal repair evaluated by second look arthroscopy. Am J Sports Med 1991;19:632-8.
  25. Laurendon L, Neri T, Farizon F, Philippot R. Prognostic factors for all-inside meniscal repair: A 87-case series. Orthop Traumatol Surg Res 2017;103:1017-20.
  26. Scott GA, Jolly BL, Henning CE. Combined posterior incision and arthroscopic intra-articular repair of the meniscus. An examination of factors affecting healing. J Bone Joint Surg Am 1986;68:847-61.
  27. De Haven KE, Arnoczky SP. Meniscus repair: Basic science, indications for repair, and open repair. In: Schafer M edition. Instructional Course Lectures, 1994;43: 65-76.
  28. Warren RF. Meniscectomy and repair in the anterior cruciate ligament-deficient patient. ClinOrthopRelat Res. 1990 ;252:55-63.
  29. Erdal Uzun ,Abdulhamit Misir, Turan Bilge Kizkapan ,et al. Arthroscopic medial meniscal repair with or without concurrent anterior cruciate ligament reconstruction: A subgroup analysis. The Knee 2018;25:109-17.
  30. Jeffrey J. Nepple, Warren R Dunn, Rick W. Wright. meniscal repair outcomes at greater than five years. a systematic literature review and meta-analysis. J Bone Joint Surg Am 2012;94:2222-7.