

Mid-term Results of the Meniscus Repair using Horizontal Sub-meniscal Sutures Summary

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ABSTRACT

one of the reasons for using sub-meniscal sutures is to prevent scratching the femoral condyle cartilage. The aim of this study is to investigate the mid-term results in patients treated with this technique. 90 patients with meniscal tear with or without anterior cruciate ligament (ACL) tear were studied from 2012 to 2016. They had, at least, two years passed from their meniscus repair surgery and all treated with arthroscopic method and horizontal and sub-meniscal repair technique. Tegner-Lysholm test, IKDC, and Tegner activity test were used for clinical evaluation. Clinical success was investigated through the absence of joint line tenderness, knee locking, and negative Mac-Murray test. The interval of the trauma to the repair surgery was compared in different age and weight groups. Follow-up period was $38/4 \pm 8/2$ months (24-58). After surgery, Tegner-Lysholm and IKDC score improved significantly ($p < 0.001$). Tegner-Lysholm increased from 48/03 to 93/64 and IKDC increased from 37/18 to 91/92. Tegner activity score also significantly increased from 3.4 at the time of the damage to 5/06 after surgery ($p < 0.001$). According to the results of Mac-Nemar test, joint swelling, joint line tenderness, and knee locking were also decreased significantly after the surgery ($p < 0.001$). The results of the study were affected by the BMI less than 25, trauma to repair surgery interval less than 12 months, and the concurrent ACL repair. The use of horizontal Sub-meniscal technique in repairing the meniscus tears has clinically acceptable results. This technique is simple and it prevents the damage to the cartilage caused by suture and implant materials.

Keywords: Meniscus, Repair, Suturing technique.

INTRODUCTION

A technical problem during the repair of the meniscus is placing sutures in very posterior meniscus area. Horizontal Sub-meniscal sutures provide acceptable technique to overcome this problem and to access this portion of the meniscus with no additional cutting. Another problem with meniscal repair is the articular cartilage wear and Synovia caused by the repair materials. Parts of the implants pushed out of the meniscus can wear

articular cartilage in the contact parts and produce chronic synovitis^{37, 38, 39}. Morgan et al. concluded that clinical examination is a reliable way to evaluate the success of the meniscus treatment and re-arthroscopy takes no precedence over it³¹.

Femoral condyle cartilage may be scratched by sutures placed above the meniscus during weight-bearing or joint movements²³. One reason for the use of sub-meniscal sutures is to prevent this potential threat.

There has not been a study to examine the repair method using the sub-meniscal technique. In this study, for the first time, we study the mid-term results in patients treated with this technique.

MATERIALS AND METHODS

In this study, 90 patients were studied from 1391 to 1394. They all had been admitted to Ghazi Hospital of Medical Sciences of Tabriz with meniscus tear (with or without ACL tear) because of sports injuries and had at least two years passed of their meniscus surgery. (Surgery dates were from Farvardin 1389 to Esfand 1393). The patients entered into the study meeting the entry conditions and their medical records were extracted from the archive. The initial diagnosis in all patients was based on MRI. Clinical examinations have been performed and recorded by the main surgeon (Dr. Amir Mohammad Nawali) before surgery, during follow-up, and after 2-year follow-up. All patients treated by arthroscopic method using horizontal and sub-meniscal technique of meniscus repair. In some cases where cruciate ligament repair has been required, arthroscopic treatment has been used.

Before surgery, for all patients evaluation forms of IKDC and Lysholm / Tegner were completed and entered into the record along with the patient history sheet. In the record, the cause of the tear and trauma, the elapsed time of the injury, the type of tear, its extent and location have been recorded. Cases that also had simultaneous ACL tear were recorded separately. And those that exist simultaneously. Clinical criteria decided whether the treatment failed or not (after a 2-year follow-up period) and re-MRI or re-arthroscopy were not used to evaluate the success or failure of the treatment.

The conditions to enter into the study:

The conditions of the entry into this study include those who:

1. Suffer longitudinal vertical tear of meniscus in the red - red and white-red regions because of sporting or non-sporting trauma that are capable of repairing. (Verticality and the place of the tears are determined by pre-surgery MRI images and reparability is determined during arthroscopy and based on the criteria stipulated in authentic

orthopedic books for reparability of the meniscus¹⁸).

2. The informed consent of the individuals to participate in this study.
3. Timely referral for follow-up treatment

Exclusion criteria

1. The lack of meniscus repair
2. The lack of fracture at lower body parts of patients
3. The absence of congenital abnormalities in organs

The total number of 109 patients had been operated by using horizontal sub-meniscal technique to repair torn meniscus from 1387 to 1392. 90 patients whose two-year follow-up ended during the period 1391 to Esfand 1394 were included in the study and 19 patients excluded from the study for, at least, one of the aforementioned reasons.

Full explanation of the method and technique of the surgery

After diagnostic arthroscopy, the morphology and pattern of meniscal tear and tear area are determined and if there is locked bucket handle tear, it will be fixed. Edges of the tear is freshened by meniscus rasp and various perforations is created by a needle at the edge of the meniscus in order to create bleeding and small vascular channels. After determining the best point for the entry, a small skin incision is created and a threaded cannula with a PDS No 1 suture is passed the capsule and the tear and brought out of the bottom surface of the meniscus. We continued to cross the suture until the head of the suture is seen in the joint. The free end of the suture through the arthroscopic anteromedial portal brought out by using grasp. The second threaded cannula is passed the same incision with a 0-2 loop nylon suture and brought out of the button surface of the meniscus. All process is done carefully to avoid scratching the articular cartilage of the Tibia. Outside of the knee, free PDS is passed the loop suture. Pulling the loop suture from the entry point returns the free PDS into the joint and removed it from the skin. Loose ends of PDS are tied together with 5 or 6 simple knots. Considering the size of the tear, two to six sutures are created parallel to the joint line at the same way.

Table 1: Comparing demographic results of the study

	Female	Male	
	(%4/4) 4	(%6/95) 86	Gender
	No repair	Repair	ACL condition
	(%2/22) 20	(%8/77) 70	
	Yes	No	
	(%3/73) 66	(%7/26) 24	Arthritis before the meniscal repair surgery
	(%3/3) 3	(%7/96) 87	Arthritis after the meniscal repair surgery
	(%7/96) 87	(%3/3) 3	joint line tenderness before surgery
	(%6/55) 50	(%4/44) 40	joint line tenderness after surgery
	(%1/91) 82	(%9/8) 8	Knee locking before surgery
	(%3/13) 12	(%7/86)78	Knee locking after surgery
4 and more	3	2	1 The number of meniscus sutures
(%2/22) 22	(%4/44) 40	(%2/22) 20	(%9/8) 8
	Above 41	21-40	Under 20 Patient age
	(%7/6) 6	(%1/91) 82	(%2/2) 2
Above 13	12-Jul	4 to 6	Under3 Time length between the injury and
(%9/38) 35	(%3/23) 21	(%7/6) 6	(%1/31) 28 treatment(month)
30/01 & more	25/01-30	20/01-25	Under 20 Body mass status
(%4/14) 13	(%9/48) 44	(%3/33) 30	(%3/3) 3

After the operation, patients use a hinged knee brace for six weeks. Joint range of motion using a brace for two weeks was between 0-7 degrees with relative weight bearing. Then, another two weeks was between zero and ninety degrees. Gradually, it reached the full range of motion in the eight weeks after the surgery and full weight-bearing in the ten weeks. Follow-up period for each patient was at least two years.

The results of the repair were also compared separately in different age and weight groups and also in different groups regarding the interval of the trauma to the surgery.

The rate of recovery (increase in score) was determined after calling patients back and taking physical examination and history. In these cases, range of motion and stability of the knee and meniscus tests were investigated and recorded. Also, the time interval to do normal activities and exercise, pain and possible complications (such as infection, deep vein thrombosis and wound dehiscence) and the cases of the failure and of requiring re-treatment were investigated.

Statistical analysis

Data was analyzed using SPSS software. Quantitative data were shown as mean and standard deviation and qualitative data were shown as frequency and percentage. To compare quantitative data, T-test (Independent samples, Paired samples) and ANOVA were used and to compare qualitative data, chi-square test or McNemar test and Sign test were used. In all cases, $p < 0/05$ was considered as significant.

RESULTS

In this study, 90 patients with meniscal tear with or without tears in the anterior cruciate ligament (ACL) were studied. The gender distribution included 86 males (95/6%) and 4 females (4/4%) (Table 1). Also, 70 patients (77.8%) had ACL tear and 20 patients lacked ACL tear (22.2%). All the cases with ACL tear were treated arthroscopically along with meniscus repair.

Based on the results of the McNemar test, joint inflation rate decreased from 66 (73/3%) before the surgery to 3 (3/3%) after the surgery, the joint line tenderness decreased from 87 (96/7%) to 50

Table 2: parameters assessed in the Tegner questionnaire in various stages of meniscus repair

After surgery	After injury and before surgery	Before injury	Tegner questionnaire score about the level of activity
^b 16/0±067/5	^a 14/0±51/1	^c 17/0±28/6	Mean ± standard error
In the time of the injury compared to before injury	After surgery compared to the time of the injury	After surgery compared to before surgery	Significance
40/0±78/4-61/0±66/5-37/0±90/4-33/0±54/4-607/	^{ab} 34/0±67/3 ^b 81/0±00/5 ^{ab} 37/0±19/4 ^a 24/0±82/2	29/0±10/1-49/0±66/0-30/0±71/0-37/0±71/1-178/0	Tegner test score deference in the time between the knee injury and treatment (months)
In the time of the injury compared to before injury	After surgery compared to the time of the injury	After surgery compared to before surgery	Under 3 6-Apr 12-Jul More than 13 Significance
25/0±92/4-33/0±54/4-361/0	24/0±01/4 24/0±82/2	19/0±90/0-37/0±71/1-039/0	Tegner test score deference in the time between the knee injury and treatment (months)
In the time of the injury compared to before injury	After surgery compared to the time of the injury	After surgery compared to before surgery	Under 12 More than 12 Significance
25/0±00/5-33/0±35/4-134/0	22/0±64/3 33/0±38/3	24/0±35/1-28/0±96/0-336/0	Tegner test score in BMI
In the time of the injury compared to before injury	After surgery compared to the time of the injury	After surgery compared to before surgery	Less than 30 More than 31 Significance
41/0±97/4-24/0±88/4-38/0±92/3-225/0	* ^b 34/0±97/3 ^{ab} 25/0±54/3 ^a 35/0±53/2	33/0±00/1-26/0±34/1-52/0±38/1-678/0	Tegner test score in BMI
In the time of the injury compared to before injury	After surgery compared to the time of the injury	After surgery compared to before surgery	Less than 25 01/25 - 00/30 More than 30/01 Significance
21/0±07/5-45/0±75/3-006/0	19/0±57/3 48/0±50/3	23/0±50/1-14/0±25/0-006/0	Tegner test score deference in ACL tear
	875/0		Repair No repair Significance

After the surgery	After the injury and before the surgery	Before the injury	Tegner test score in ACL tear
19/0±97/4	14/0±40/1	20/0±47/6	Repair
31/0±40/5	39/0±90/1	30/0±65/5	No repair
287/0	153/0	049/0	Significance
After the surgery	After the injury and before the surgery	Before meniscal injury	Tegner test score in knee locking before surgery
66/0±87/5	41/0±25/1	56/0±62/7	Absence
16/0±98/4	15/0±53/1	17/0±15/6	Presence
130/0	577/0	016/0	Significance
In the time of the injury compared to before injury	After surgery compared to the time of the injury	After surgery compared to before surgery	Tegner test score deference in knee locking before surgery
56/0±37/6-	73/0±62/4	64/0±75/1-	Absence
21/0±62/4-	19/0±45/3	20/0±17/1-	Presence
014/0	074/0	391/0	Significance

(55/6) and the locking of the knee from 82 (91/1%) to 12 (13/3%). These show a significant decrease ($p < 0.05$).

In the Tegner questionnaire score about the level of activity, there is a significant difference among all groups of "interval between injury and surgery". After the meniscus repair, despite an improvement in the questionnaire score compared to before the meniscus injury, there is a significant difference ($p < 0.05$). Tegner questionnaire score deference after the surgery compared to the time of the injury had the highest level at the time interval 4 to 6 months and it had the lowest level at the time interval of "more than 13 month". Also, the rate of repair in cases with "less than 12 months" was significantly better than repair in cases with "more than 12 months".

Based on the results, best results with statistically significant differences was obtained in the group with BMI less than 25 comparing "after surgery to the time of the injury" ($p > 0.05$). Tegner test score deference in the ACL tear showed that the condition of the meniscus repair was significantly better in the group with ACL compared to the group without ACL (i.e. isolated meniscus

damage) comparing after surgery to before surgery.

Tegner-Lysholm and IKDC questionnaires' score increased significantly after surgery ($p < 0.01$). The Tegner-Lysholm and IKDC questionnaires' score differences had no significant deference after surgery than before surgery in deferent time intervals to the treatment and deferent BMI's, in ACL tear with or without repair and knee locking before the surgery.

DISCUSSION AND CONCLUSION

Meniscus tear is usually is created by a combination of mechanical forces with or without prior meniscus injuries (such as degeneration and etc.). If there is previous injury, the tear may be less traumatic. Different types of treatment are used for meniscus tear. Today, repair methods are the most preferred one. Success of the repair is dependent on many factors. According to some researchers, meniscus is considered repaired when the effusion and tenderness in the joint space are fixed and McMurray's test result is negative. If one or several of these factor are still standing, or minor factors reoccur, or further surgery is needed, the repair is not successful. Some researchers also consider the

Table 3: Assessed parameters in Tegner-Lysholm and IKDC questionnaires in various stages of meniscus repair

	After surgery	Before surgery	Tegner-Lysholm questionnaire score
	91/0±64/93	88/1±03/48	Mean ± standard error
	After surgery	Before surgery	Significance
	94/0±92/91	04/2±18/37	IKDC questionnaire score
		001/0	Mean ± standard error
After surgery compared to before surgery	IKDC questionnaire score difference between knee injury and treatment (months)	After surgery compared to before surgery	Significance
	Less than 3	72/4±75/47	Tegner-Lysholm questionnaire score difference between knee injury and treatment (months)
71/4±44/62	4 to 6	83/6±50/28	Less than 3
93/10±75/42	7 to 12	62/4±90/46	4 to 6
04/5±19/52	More than 13	86/2±05/46	7 to 12
59/2±17/52	Significance	222/0	More than 13
104/	IKDC questionnaire score difference between knee injury and treatment (months)	After surgery compared to before surgery	Significance
After surgery compared to before surgery			Tegner-Lysholm questionnaire score difference between knee injury and treatment (months)
	Less than 12	13/3±32/45	Less than 12
36/3±38/56	More than 12	86/2±05/46	More than 12
59/2±17/52	Significance	873/0	Significance
374/0	IKDC questionnaire score difference in BMI	After surgery compared to before surgery	Tegner-Lysholm questionnaire score difference in BMI
After surgery compared to before surgery			
	Less than 30	81/2±91/45	Less than 30
87/2±10/55	More than 31	55/3±03/45	More than 31
83/3±05/54	Significance	850/0	Significance
828/0	IKDC questionnaire score difference in BMI	After surgery compared to before surgery	Tegner-Lysholm questionnaire score difference in BMI
After surgery compared to before surgery			
	Less than 25	70/3±21/48	Less than 25
21/4±47/54	25/01 to 30/00	18/3±27/45	25/01 to 30/00
24/3±59/55	More than 30/01	40/5±15/40	More than 30/01
62/4±58/52	Significance	500/0	Significance
907/0	IKDC questionnaire score difference in ACL tear	After surgery compared to before surgery	Tegner-Lysholm questionnaire score difference in ACL tear
After surgery compared to before surgery			
	Repair	36/2±81/45	Repair
26/2±31/56	No repair	60/5±90/44	No repair
58/6±24/49	Significance	864/0	Significance
201/0			

After meniscus repair surgery	Before meniscus repair surgery	IKDC questionnaire score in ACL tear	After meniscus repair surgery	Before meniscus repair surgery	Tegner-Lysholm questionnaire score in ACL tear
00/1±54/92	18/2±22/36	*1E`E	08/1±62/93	01/2±81/47	Repair
32/2±77/89	14/5±53/40	(/HF *1E`E	58/1±70/93	79/4±80/48	No repair
223/0	383/0	Significance	974/0	829/0	Significance
After meniscus repair surgery	Before meniscus repair surgery	IKDC questionnaire score in knee locking before surgery	After meniscus repair surgery	Before meniscus repair surgery	Tegner-Lysholm questionnaire score in knee locking before surgery
46/2±82/92	98/4±16/42	Absence	41/1±75/95	10/4±25/54	Absence
00/1±84/91	18/2±69/36	Presence	98/0±43/93	01/2±42/47	Presence
768/0	449/0	Significance	474/0	304/0	Significance
After the meniscus repair surgery	IKDC questionnaire score deference in knee locking before surgery	Before meniscus injury	Tegner-Lysholm questionnaire score deference in knee locking before surgery		
09/5±66/50	Absence	35/4±50/41	Absence		
46/2±14/55	Presence	38/2±01/46	Presence		
581/0	Significance	563/0	Significance		

following as the cases of successful treatment; little pain or tenderness or lack of it, lack of Locking, emptiness below the knee and significant inflation in the knee, and no need to re-surgery.

The meniscus function in weight bearing, energy absorption and joint stability and creating articular surface homogeneity is remarkable. Several therapeutic techniques are available, but it seems that repair by suture have the largest biomechanical stability⁶. Methods of treatment for meniscal tear or damage include Meniscectomy (total or partial) or meniscus repair as open and arthroscopic inside out, inside out, all inside²⁶.

Basically, suturing technique is effective on the suture tolerance against the exerted forces. Some sources confirmed that tensile strength in vertical loop technique is about 115 Newton and in the horizontal suture is about 75 Newton. In another study, the strength in sutures with Single Vertical Loop technique is 63 Newton and for horizontal sutures is 29 N⁶. It should be noted that these are in vitro studies and applied force is based on stretch that is much different from humans. Horizontal suture technique described in 1995 by Johnson and Mulberry technique first described in 1990 by Cooper. Both are used in the in-out and out-in cases¹⁷. Considering the strength, vertical suture is

usually considered as the gold standard and according to different types, vertical suture strength has been estimated around 60-200^{13,33}.

Horizontal sutures are placed between peripheral fiber bundles and fail with less force because inside the fibers the force is so that horizontal sutures, during periodic testing, have similar structure in comparison with vertical sutures and may have useful characteristics of each category i.e. vertical (greater biomechanical strength) and horizontal (simplicity, longer suture with the desire to cover a larger area of meniscus tissue)²⁵.

However, the clinical success rate does not correlate well with the mechanical strength of repair techniques and available information does not indicate that stronger repairs are associated with better results³⁹.

A technical problem during the meniscus repair is placing the sutures in the very posterior area of meniscus. Horizontal Sub-meniscal sutures provide acceptable technique to overcome this problem and to access this portion of the meniscus with no additional cutting. Another problem with meniscal repair is the articular cartilage wear and Synovia caused by the repair materials. Parts of the implants pushed out of the meniscus can wear articular cartilage in the contact parts and produce chronic synovitis^{37, 38, 39}. Morgan et al. concluded that clinical examination is a reliable way to evaluate the success of the meniscus treatment and re-arthroscopy takes no precedence over it³¹.

Femoral condyle cartilage may be scratched by sutures placed above the meniscus during weight-bearing or joint movements²³. One reason for the use of sub-meniscal sutures is to prevent this potential threat.

According to the researchers, in the cases that the meniscus repair is associated with reconstruction of the anterior cruciate ligament, better results have been achieved^{11, 42, 15, 1, 9, 31}. Also, the repair at an earlier age and with little time interval from the onset of clinical signs has led to better results. In some studies it has reported 6 weeks⁴¹, 8

weeks^{19,21}, and within 3 months⁴². Also, if you refresh the site of the tear and use sutures instead of absorbable or hybrid things, the results will be better. According to the results of this study and based on the Tegner Lysholm and IKCD questionnaires' score difference, the repair rate has produced better results in the cases under three months and also in the period under 12 months.

According to the results of this study, repair rate based on Tegner questionnaire score about the level of activity after the surgery was $5/067 \pm 0/16$ that is statistically significant compared to the "damage time" that was $1/51 \pm 0/14$ ($p < 0.05$). Also, 4 to 6 months after surgery compared to the time of the injury Tegner questionnaire scores was $5/00 \pm 0/81$ and it was significantly different from cases who treated after 13 months ($p < 0.05$).

Based on Tegner-Lysholm and IKDC questionnaires score difference after surgery compared to before surgery, the difference between the scores of both questionnaires had no significant differences between the month under the comparison. It had highest rate at less than 3 month and lowest rate at 4-6 month.

In a study conducted by Asike and et al⁶ in Turkey in 2002, 61 patients were studied. They were operated for meniscal repair for unstable vertical and longitudinal tear larger than one centimeter. 43 patients were male and 18 were female with an average age of 26 years and age gap of 17 to 22 years. In 47 patients, in addition to the damage to the meniscus, there was anterior cruciate ligament tear. Result in 14 patients was excellent and in other cases was fair. All patients after six months had the ability to return to sports activities.

In this study, 70 cases (77/8%) had ACL tear and repair and in 20 cases (22/2%) there was no need for the repair. 66 cases (73/3%) had joint swelling before surgery that reduced to 3(3/3%) after repair. 87 cases (96/7%) had joint line tenderness before surgery that reduced to 50 cases (55/6%) after repair. Knee locking reduced from 82(91/1%) to 12 (13/3%). According to the results, meniscus repair surgery with horizontal sub-meniscal method have good results.

Fantasia and et al¹⁷ in 2012 studied the tensile strength of sutures in laboratory environments. They studied 55 meniscus tear with 1/5 cm length. The results show high tensile strength of mulberry techniques compared to horizontal method. Strength of Mulberry method sutures was about 30 Newton. In Fok and yau study¹⁸, the preliminary results of all inside meniscal repair using anchor sutures have been studied. This study conducted on 51 patients with a mean age of 26 and on 57 meniscus from 2008 to 2010. Meniscus repair method is evaluated by preloaded suture anchor method. Significant improvement was observed in patients, especially in cases where there was ACL tear. Simultaneous repair had increased the function in patients. There was statistically significant difference in these cases.

There are many differences in reports on the results of meniscal repair using arthroscopy method. Morgan and Kasz reported 98/6 percent clinical success rate³⁰. Albrecht-Olsen and Bak reported 10 failure out of 27 repairs that success rate was 63% (2). Most long-term studies have reported 70 to 80 percent clinical success^{7, 22, 14}.

According to reports, results of the meniscus repair in the knee without anterior cruciate ligament is better when the ligament is also repaired simultaneously 18-20. Good results (71% success) have been reported in the treatment of medial meniscus and ACL ligament⁴². It seems that hemarthrosis created during ACL repair stimulates serum factors that will help to improve the meniscus. In addition, meniscus repair protects abnormal shear stress caused by joint stability increasing⁴².

According to this study, Tegner questionnaire score difference (level of activity) after surgery compared to the time of the damage was $3/57 \pm 0/19$ and was higher than the group without ACL repair ($3/50 \pm 0/48$). However, the difference was not statistically significant.

Also, Tegner-Lysholm and IKDC questionnaires' score difference in the repair group of ACL was more than the group without repair, but this difference was not significant. However, after surgery Tegner-Lysholm questionnaire score in ACL repair group was less than that in group without

repair. IKDC questionnaire score in ACL repair group was higher than the group without repair. According to findings, Tegner-Lysholm and IKDC questionnaires' score increased significantly than before surgery. It reflects the positive effects of treatment on patients.

Meniscus creates compliance and stability in the knee through distributing the pressure inside the knee joint and it works as shock absorber. It also decreases the pressure transmitted through joint cartilage and subchondral bone^{20, 34, 5, 32}. It seems that meniscus transmits a little over half of the pressure caused by the weight to the knee joint²⁷. So, a biomechanical mechanism may be considered for the association between meniscal damage and BMI. With increasing BMI, traction and torque increase in the knee during the spin and theoretically increases the likelihood of damage to the meniscus. However, other involved mechanisms such as decreased blood flow to the meniscus^{12, 40, 4, 3, 20} or low-grade inflammation associated with obesity²⁹ are not very clear. In obese individuals, the blood supply to the meniscus will be limited due to mechanical impact of weight on the vessels or cardiovascular risk factors. The blood supply has also an important role in the healing of meniscal tear^{4, 3, 20, 24}.

According to the results of this study and comparing Tegner test score difference and comparing Tegner-Lysholm and IKDC test score difference, the repair after surgery compared to the injury time in the group with BMI less than 30 was better than the group with BMI above 31. Comparing individuals with BMI less than 25, 25.1 to 30, and more than 30/01 showed that in terms of the difference of activity level test of Tegner and Tegner-Lysholm questionnaire score difference after surgery compared to damage time the best repair rate was in the group of patients with BMI below 25/00. The results of this study are consistent with previous studies.

The results of the study showed that meniscal repair using horizontal sub-meniscal suture method has been successful in the treatment of meniscus tear and it has the similar results of other treatment methods.

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