

Original Research Article

A Prospective Study Of The Clinical Outcome Of Arthroscopic Meniscus Repairs Done By Various Modalities

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ABSTRACT

Introduction: The meniscus plays an essential role in the knee as a load-transmitter and shock absorber. Healthy meniscus is usually injured by a combination of compression and rotation of the tibiofemoral joint. Arthroscopic meniscal repair has gained popularity because of the shortened surgery time, a smaller incision, and better access to the tear portion, which is particularly difficult during open surgery. Four types of arthroscopic repair techniques: inside-out techniques, outside-in techniques, all-inside techniques, and hybrid techniques that combine multiple techniques. We are discussing the outcome of meniscal repairs on follow-up at 12 months in comparison with preoperative status.

Materials and methods: Between 2019 and 2021, this prospective study evaluated patients with meniscal tears who underwent arthroscopic meniscal repair and studied their outcomes postoperatively. The study included three types of meniscal repair: outside in, all inside, and hybrid techniques, including both outside in and All inside. Patients were assessed on the 3rd, 6th, and 12th month based on the International Knee Documentation Committee (IKDC) rating, Lysholm score, and Tegner activity levels.

Results: IKDC was preoperatively (50.14±13.17), postoperatively at 3 months (74.56±5.06), at 6 months (85.67±3.62) and 1 year (88.23±2.69)(with P-value (0.001). Tegner Lysholm score was preoperatively (58.23±12.28), postoperatively at 3 months (84.41±7.45) at 6 months (90.34± 5.24) and 1 year (94.32±2.86) (with P-value (0.001). There were no postoperative complications at 3,6, and 12 months' follow-up.

Conclusions: It was concluded in our that meniscal repair through arthroscopy is an effective way for the management of meniscal tears regarding clinical and functional outcomes.

Keywords: Arthroscopic, Meniscus Repairs

INTRODUCTION

As a load-transmitter and shock absorber, the meniscus plays an essential role in the knee. It Provides proprioception, lubrication, and nutrition to the articular cartilage of the knee joint by

acting as a secondary anteroposterior stabilizer¹. A healthy meniscus is usually injured by a combination of compression and rotation of the tibiofemoral joint.

It is common for this type of coupled force to occur during athletic movements involving sudden directional changes, such as cutting and pivoting². Meniscal injuries are a significant cause of musculoskeletal morbidity and mortality. Furthermore, long-term damage may lead to joint degeneration such as osteophyte formation, cartilage erosion, narrowing of joint spaces, and symptomatic osteoarthritis.^{3,4}

The first meniscal repair was performed arthroscopically about forty years ago by Hiroshi Ikeuchi. As arthroscopic equipment and surgical techniques improved, arthroscopic meniscal repair became possible. Additionally, arthroscopic meniscal repair has gained popularity because of the shortened surgery time, a smaller incision, and better access to the tear portion, which is particularly difficult during open surgery⁵. The inside-out suture technique that uses arthroscopically directed cannulas in conjunction with a posterior incision was popularized by Scott et al⁶.

The outside-in suture technique emerged as an effort to reduce the risk to neurovascular structures involved with the inside-out technique⁷. As a result, techniques like all inside repair using biodegradable devices are becoming popular, and in cases of irreparable damage to the meniscus in young individuals, meniscal replacement has become a treatment option.

The indications and technique for meniscal excision have been controversial. Long-term follow-ups after excision of torn menisci, especially after total meniscectomy, have shown increasing degenerative changes^{8,9}. In Compared to meniscal repair, meniscectomy has lower clinical outcome scores.

Meniscal rim preservation is strongly recommended compared to complete removal of the meniscus, unless it is irreparably damaged^{10,11}. Despite meniscal repairs being preferred over meniscectomies, especially in young or adolescent patients, meniscectomy remains a common orthopaedic procedure¹². For young patients, an acute 1 to 2 cm longitudinal peripheral tear can be repaired in conjunction with anterior cruciate ligament reconstruction¹³. Several factors affect the reparability of meniscal tears, such as vascularity, type, chronicity, and size. Compared to a radial or flap tear on a white-white zone, a longitudinal tear on the red-red zone has a better chance of healing in an acute setting.

There are four types of arthroscopic repair techniques: inside-out techniques, outside-in techniques, all-inside techniques, and hybrid techniques that combine multiple techniques. In the middle-third horn or peripheral capsule area, a meniscal tear can be repaired from the inside out. The outside-in technique can be used to repair a meniscal tear on the anterior horn or reduce a bucket-handle tear. A posterior horn meniscal tear can be treated using the all-inside technique. Currently, we are discussing the outcome of meniscal repairs on follow-up at 12 months in comparison with preoperative status.

MATERIALS AND METHODS

Between 2019 and 2021, this prospective study evaluated patients with meniscal tears who underwent arthroscopic meniscal repair and studied their outcomes postoperatively. The arthroscopic meniscal repair is performed using the above-mentioned repair methods by explaining the procedure's advantages and risks to patients before the procedure. Post-operatively, patients are followed up for a period of 12 months. Post operatively patients are followed up for the period of 12 months.

Inclusion criteria:

1. An MRI revealed a meniscal tear that required repair.
2. The patient is between 15 and 60 years old and shows skeletal maturity on radiographs.
3. All tears in the red-red and red-white zones with acceptable tissue quality indicated meniscal repair.

Exclusion criteria:

1. Additional ligament injury or laxity requiring surgical intervention on contralateral knee.
2. Other fractures associated with meniscal injuries.
3. No previous meniscal injury.
4. No previous meniscal fixation.
5. Ipsilateral or contralateral osteoarthritic knee

The whole skeleton was examined quickly and thoroughly to rule out any associated injuries or fractures. The ipsilateral knee was examined to detect meniscal tears and severity, swelling, ecchymosis, skin conditions, local tenderness, bony deformities, ligamentous injuries, and range of motion.

The study included three types of meniscal repair: outside in, all inside, and hybrid techniques, including both outside in and All inside. For a period of one year, patients were assessed on the 3rd, 6th, and 12th month. Based on the International Knee Documentation Committee (IKDC) rating, Lysholm score, and Tegner activity level, patient outcomes were assessed.

Prior to the skin incision, a prophylactic antibiotic was given. A supine position is achieved following induction of anaesthesia, with the patient lying close to the edge of the operating table on the operative side. A tourniquet was applied and inflated after exsanguination.

Standard anterolateral and anteromedial portal made. Diagnostic arthroscopy has been done. With the knee in slight flexion, valgus stress was applied to access the posterior medial meniscus. Using a figure of four approach, access the posterior part of the lateral meniscus.

OUTSIDE IN TECHNIQUE

An 18-gauge spinal needle was passed across the tear from the outside in. A fire wire was passed through the lumen of the needle and pulled through the arthroscopic ipsilateral portal once the sharp tip of the needle was visible. The Lasso loop technique was used. Once the tear is stabilized, the free ends are tied two by two over the capsule through an accessory skin incision.

ALL INSIDE TECHNIQUES

Fibre stitch implants from Arthrex were used for the entire repair. Fibre stitch implants have a straight design as well as a 24-degree curve. The needle should be placed, and the implant should be deployed by turning the wheel back and forth. Repeat for implant 2, Remove the handle, apply tension to the loop and pull it to close the first suture construct; stop pulling when the meniscal tear is closed, and the straight suture begins to move. Pull on the straight suture to close the second construct, Cut the suture at the meniscus. 3rd hybrid technique is used for bucket handle tear.

POST OP PROTOCOL

On the second postoperative day, the dressings were debulked, and the wounds were examined for redness, discharge, or other signs of infection. Strengthening of the quadriceps and hamstrings through static and dynamic exercises. In addition, exercises and partial weight-bearing walking are initiated. We aim to achieve knee flexion of at least 90 degrees by the end of the 3rd week and 120 degrees by the end of the 4th week. Patients are advised to use a knee brace for at least 4 weeks following surgery. At 3 weeks, 6 weeks, and 12 weeks, 6 months, and 12 months, Lysholm score, Tegner activity score, IKDC score, and Barrett's criteria include joint line palpation, knee joint effusion, and Mc Murray test.

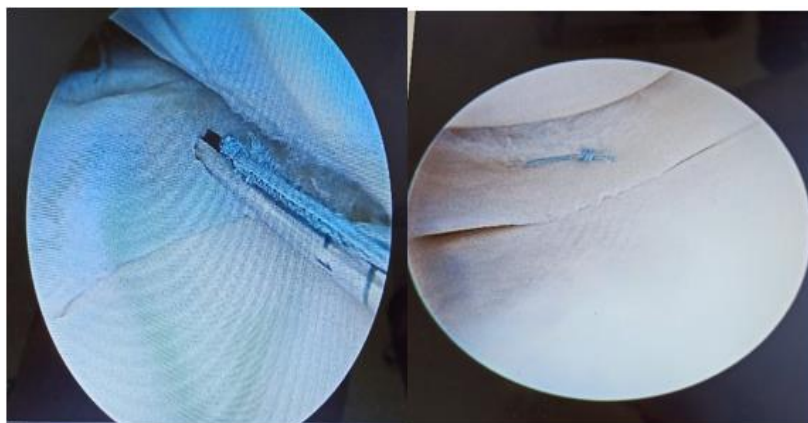


Figure 1: All Inside Technique

RESULTS

Thirty patients (21 males and 9 females) were included in the study with an age range from 18 to 46 years with mean age of 31.5 years. The left knee was involved in 13 (46.67 %) of patients and the right knee in 17 (54.5%) of patients. Sports-related injuries accounted for 56.67% (17 cases), followed by falling downstairs (23.33%, 7 cases). A total of 20 cases of Medial Meniscus (MM) tears (66.67%), 6 Lateral Meniscus (LM) tears (20%), and 4 mixed MM and LM tears (13.33%) were reported. Out of a total of 30 cases, 9 cases had bucket handle tears, 15 tears were of horizontal type and the remaining 6 tears were of longitudinal/vertical type.

Twenty-two patients (73.33%) had meniscal tear associated with ligamentous injury (ACL or PCL), of which 20 cases underwent ACL reconstruction and two cases underwent PCL reconstruction. A total of 8 cases (26.67%) presented with an isolated meniscal tear. Based on the techniques used (outside-in, all-inside, and combined), the most used technique was All Inside which represents 62.3% of all cases.

Table 1: Demographic data and clinical characteristics

VARIABLE	VALUE
Gender	
Male	21 (63.33%)
Female	9 (36.67%)
Mean Age	31.5 years
Side involved	
Right knee	17 (53.33%)
Left knee	13 (46.67%)
Side of meniscus	
Lateral	6
Medial	20
Mixed	4
Type of tear	
Bucket handle	9
Horizontal tear	15
Longitudinal	6
Procedure	
All inside	20
Outside in	7
Outside in+All Inside	3

All patients were assessed postoperatively by IKDC and Tegner Lysholm Knee Scores at 3 months, 6 months and at 1 year and compared with respective preoperative scores as described in

Table 2: Preoperative and postoperative IKDC and Tegner Lysholm Knee Score

	Pre- op	3 months post-op	6 months post-op	1-year post-op	p ¹	p ²	p ³
IKDC score Mean ± SD Range	50.14±13.17 21.20-76.40	74.56±5.06 53.4-82.6	85.67±3.62 70.2-94.5	88.23±2.69 81.3-95.2	p<0.01	p<0.01	p<0.001
Tegner Lysholm Knee Score Mean ± SD Range	58.23±12.28 38-86	84.41±7.5 70-95	90.34± 5.24 80-98	94.32±2.86 90-99	p<0.01	p<0.01	p<0.001

p^1, p^2 and p^3 are the p values compared to pre-operative at 3 months, 6 months and 1 year postoperatively, respectively.

As shown in table 3, the IKDC and Tegner Lysholm Knee Score (pre- and postoperatively) of patients with ACL reconstruction and meniscal repair (20 cases) were compared to patients with only meniscal repair (8 cases).

Table 3: IKDC and Tegner Lysholm Knee Score (pre and postoperatively)

	IKDC score			Tegner Lysholm Knee Score		
	Associated Injury			Associated Injury		
	Nil (n=8)	ACL (n=20)	p value	Nil (n=8)	ACL (n=20)	p value
Pre-op	48.25± 15.45	51.04±13.31	0.636	57.21±13.07	58.95±12.89	0.75
3months post-op	76.62±6.23	73.98±5.20	0.261	86.24±6.98	84.12±7.56	0.50
6 months post-op	87.07±3.24	85.20±3.11	0.168	91.45±4.65	89.96±5.23	0.489
1 yr post-op	88.97±2.89	88.08±2.66	0.441	94.80±3.26	93.78±2.45	0.373

In our study meniscal repair healing is assessed Clinical Criteria of Barrett et al and 2 cases showed repair failure and underwent revision partial meniscectomy¹⁴. No other complications seen like infection, ACL graft failure

DISCUSSION

Thirty patients met inclusion criteria and underwent meniscal repair through various meniscal repair techniques as described above. Patients were serially followed up to 12 months. Examination findings were documented at 3rd, 6th and 12th month post operatively. Principle findings of the study are as follows. Mean patient age is about 31.5 years (range 18 -46 years). There are 21 males (63.33%) and 9 female (36.67%) included in the study. In a similar study by Simpson et al, the mean age of 230 patients was 30.7 years (range from 7 to 67 years). Nearly half of the patients were in their third decade and formed 90 % of the cases¹⁵.

We found bucket handle tears in 40.9 % of patients, longitudinal tears in 18.2% of patients, making up 60.1 % of the cases, and horizontal tears in 40.9 % of the cases. Whereas in series conducted by Rao et al longitudinal tears seen in 63.72% tear 7.87 %, other types constitute 21.15 %¹⁶. There were more vertical or longitudinal tears in D.J Dandy's series than any other type of meniscal tear¹⁷. When comparing the isolated meniscal repair and the meniscal repair associated with ACL reconstruction, we found no significant difference in IKDC (mean 76.62,73.98) or Tegner and Lysholm scores (86.24,84.12). Similar results in case of study conducted by August et al were not able to document any failure rate difference between patients with and without concurrent ACL reconstruction. However, lower failure rates were documented when meniscus repair is combined with ACL reconstruction¹⁸.

The results of our study indicate that repair of meniscal tears resulted in a 29.4% failure rate and 70.6 % cases healed by the end of 6 months follow-up, which compares to other studies with similar

results based on Barrett's criteria in which 2 of the 6 patients had pain on joint line palpation and 1 had knee joint effusion at 6 months. Alejandro Espejo-Reina et al studied outcomes of repair of chronic bucket handle tears of medial meniscus which include follow up of 24 patients followed for time of 48 months (range, 24 to 112 months) and showed 83% of meniscus healed and 17 %failure rate seen considering Barretts criteria for failure and showed significant improvement in IKDC, Tegner and Lysholm, Tegner activity level¹⁹.

After an average follow-up period of 18 months, Kotsovolos et al²⁰, shows 61 menisci were repaired using the FasTFix meniscal repair system. They had a 90% success rate (55 meniscal tears healed clinically out of 61), and 51 patients (88%) had excellent or good results. Patients with isolated meniscal tears are more likely to fail. Two out of three patients with isolated tears have positive Mc Murray tests and chronic bucket handle tears.

In our study IKDC scores on follow up for 6 months improved from pre op level of 50.14 to 6 months post op mean of 85.67 which is strongly significant. Tegner and Lysholm scores also increased from mean of 58.23 from pre op level to 90.34 on 6 months follow up. Similar results are found in study by Chih-Wei et al studied 31 patients among which 18 underwent isolated meniscal repair and 13 underwent meniscal repair with ACL both groups showed significant improvement of IKDC, Tegner and Lysholm, Tegner activity level which are very strongly statistically significant²¹. Second-look arthroscopy, according to August W. M Fok, is still the gold standard for assessing meniscal healing. Due to the procedure's invasiveness, it cannot be used in routine clinical practice. After a meniscal repair, healing can be assessed using clinical symptoms, however absence of symptoms does not always indicate healing¹⁸. There was a 58% sensitivity and a 75% specificity reported. Meniscal healing can be evaluated with MRI since it is non-invasive and readily available. During healing, fibrous, or oedematous scar tissue may persist and interfere with imaging interpretation. Therefore, its diagnostic value in meniscus repair has been questioned. Combining several MRI sequences led to a sensitivity of 92% and specificity of 99%.

CONCLUSION

In about 29.4% of patients, arthroscopic meniscal repair leads to favourable clinical outcomes. Isolated meniscal repair does not differ significantly from meniscal repair with ACL reconstruction in terms of outcomes. Compared to chronic horizontal and acute tears, chronic buck handle tears are significantly more likely to fail.

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