



Evaluation of Functional Outcome of Arthroscopic Meniscal Repair of knee Joint – An Observational Study

Dr. Ravikiran H.G.¹, Dr. Vijay C.², Dr. Aravinda K.N.³, Dr. Adarsh T.⁴

2199

¹ Associate professor, Department of Orthopaedics, Shri Sathya sai Medical College and Research Institute, Kanchipuram, Tamil Nadu, India.

² Associate professor, Department of Orthopaedics, JSS Medical College, JSS Academy of Higher Education and Research, Mysore, Karnataka, India.

³ Orthopedic surgeon, District hospital, Mysore, Karnataka, India.

⁴ Assistant professor, Department of Orthopaedics, JSS Medical College, JSS Academy of Higher Education and Research, Mysore, Karnataka, India.

Corresponding Author:

Name: Dr. Ravikiran H.G., Associate professor, Department of Orthopaedics, Shri Sathya sai Medical College and Research Institute, Kanchipuram, Tamil Nadu, India.

Abstract

Background

The knee joint is a complex weight bearing joint in the human body. The menisci in the knee are frequently prone to injuries in young individuals particularly in athletes. The menisci are vital for the normal function and long-term health of the knee joint and are recognized as a cause of significant musculoskeletal morbidity. Arthroscopic meniscal repair is a gold standard for meniscal injury but evaluating the functional outcome is rarely done. This study aims to evaluate the clinical and functional outcome of the knee in patients who underwent arthroscopic meniscal repair.

Methods It is a prospective observational study conducted on 23 patients from January 2018 to June 2019. All patients were clinically evaluated for meniscal tears and confirmed by magnetic resonance imaging. All patients underwent arthroscopic ALL INSIDE meniscal repair technique and were evaluated for functional outcomes using the LYSHOLM score. **Results** The mean age was 32.39 +/- 9.24 years. Road traffic accidents were the most common mode of injury. In the initial follow-up after 6 weeks, functional outcome was calculated and the majority of the patients (n=22) were in the fair group. With strictly following the rehabilitation protocol, finally, at the end of 12 months, 12 patients showed significant improvement (P=0.001) in their functional outcome and were grouped under excellent and 11 patients under good. **Conclusion** The study concluded that arthroscopic meniscal repair is a very effective method of treating meniscal injuries. It gives painless functional knee postoperatively with a good range of movements and increased quality of life.

Keywords

All inside technique, Arthroscopic meniscal repair, Knee joint, Lysholm score, Meniscal injuries.

DOI Number: 10.14704/NQ.2022.20.12.NQ77194

NeuroQuantology2022;20(12): 2199-2204

INTRODUCTION

The knee is a modified hinge joint. It is a complex weight-bearing joint of the lower limb. The location and absence of thick muscular covering for its protection make it more prone to injuries. Meniscus and ligaments tears are important consequences of twisting knee injuries. The menisci are important for the normal purpose and long-standing health of the knee joint and their injuries are documented as a cause of the substantial musculoskeletal disease.^[1]

The meniscus helps in force transmission, shock absorption, joint lubrication and maintains joint stability. The establishment of these functions of the meniscus has made it an important structure to be

preserved by repair or resection rather than removing it completely which was one of the most preferred treatment options previously followed for meniscal tears.^[2] Untreated meniscal tears can reduce activities of daily living and participation in exercise and sports. Later it can advance into permanent damage of articular cartilage leading to arthritis. Preservation of meniscus as much as possible is highly recommended. Due to loss of the meniscus integrity, pressure on the adjacent remaining articular cartilage increases. This leads to marked changes in kinematics and delivery of load in the knee joint which are demonstrated in various studies. Resection of 15-34 % of the meniscus tissue results in additional load on



the hyaline cartilage up to 35%.^[3] Longitudinal tears of the meniscal horns changes the distribution of load within the knee joint. This will lead to osteoarthritis in the future.^[4]

The treatment option selected for meniscal tears should be able to preserve as much meniscal tissue as possible. For preserving the meniscus, suturing is the best treatment option. Suturing which was earlier done by open surgery now can be done using arthroscopy which has several advantages compared to open surgery.^[5] Arthroscopy is a minimally invasive surgery offering advantages like decreased risk of surgical complications and infections, for rapid healing and less pain. Arthroscopy helps patients to return to their normal life very quickly.

Lysholm Score

The Lysholm score is authenticated as a patient-administered tool to measure symptoms and functions of daily activities in patients with a variety of knee injuries. This gauge has eight domains scored on a scale of 0 to 100, with higher score indicating fewer symptoms and higher levels of functioning.^[6]

AIMS AND OBJECTIVES

Primary

To evaluate the clinical and functional outcomes in patients who undergo meniscal repair for meniscal tears.

Secondary

To evaluate the common mechanisms causing knee derangements.

MATERIALS & METHODS

Study type

Prospective observational surgery

Study Population

23 cases of knee trauma with meniscal injuries, diagnosed by clinical evaluation and confirmed peripheral meniscal tear by magnetic resonance imaging treated at a tertiary care center. All these were operated by arthroscopic meniscal repair by all-inside technique and are evaluated for functional outcome using Lysholm score.

Sampling Method

Convenient sampling.

Study Duration

The follow-up of all patients was done at 3, 6, 9, 12 weeks and 12 months from January 2018 to June 2019. Lysholm scoring was calculated at every follow-up.

Inclusion Criteria

1. Patients aged between 16-60yrs of both genders.
2. Patients with meniscal injury in the vascular zone.

Exclusion Criteria

1. Patients with signs of acute and chronic infections around the knee.
2. Cases with knee Arthritis and Osteoporosis.
3. Cases with Ankylosed knee and Congenital defects of the knee.

Statistical Methods

Functional outcome was the primary outcome variable. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Information was also represented with bar diagrams. The mean functional outcome score at different follow-up periods was compared using the one-way repeated measures ANOVA. Statistical significance of the Pairwise differences was assessed by paired t-test. P-value < 0.05 was measured as a statistically noteworthy difference. IBM SPSS statistical software version 21 was used for data analysis. P-value < 0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis. Institutional ethical committee and patient approval was taken before the study was commenced.

Surgery

The standard portals for diagnostic arthroscopy i.e anterolateral and anteromedial portals were used in all cases.

ALL inside technique: This arthroscopic technique is the most preferred meniscal repair technique because of less operative time. In this technique, the sutures are tied intra-articularly. Implants are made of everlasting or absorbable materials.^[7-9] (Figure 1-3)

Postoperative Protocol

A series of rehabilitation protocols and the same was used for all the patients. (Table 1)



RESULTS

A total of 23 cases of meniscal injury were recruited for the study analysis. The mean age was 32.39+/- 9.24 years, minimal age was 17 years and maximum age was 54 years. A major portion (47.8%) of the study population belonged to the 30 to 39 years of age group. There was a male predominance as 19 (82.6%) of the study population were males. Among all the patients, the majority of them sustained a meniscal injury to the knee was by a road traffic accident. (Table 2) In the initial follow-up after 6 weeks, functional outcome was calculated and the majority of the patients (n=22) were in the fair group. By strictly following the rehabilitation protocol, nearly 11 patients

improved from fair to good by 9 weeks and 21 patients by 12 weeks. At 12 months, 12 patients improved significantly to the excellent group and 11 to the good group. (P=0.001). (Table 3) In the consecutive follow-up at 9 weeks, functional outcome improved (P=0.001) from fair to good in 10 patients which were significant. (Table 4) At the end of 12 weeks, 21 patients presented noteworthy development (P=0.001) to the good group and 2 patients into the excellent group. (Table 5). Finally, at the end of 12 months, 12 patients showed momentous enhancement (P=0.001) in their functional outcome and were grouped under excellent and 11 patients under good. (Table 6, 7).

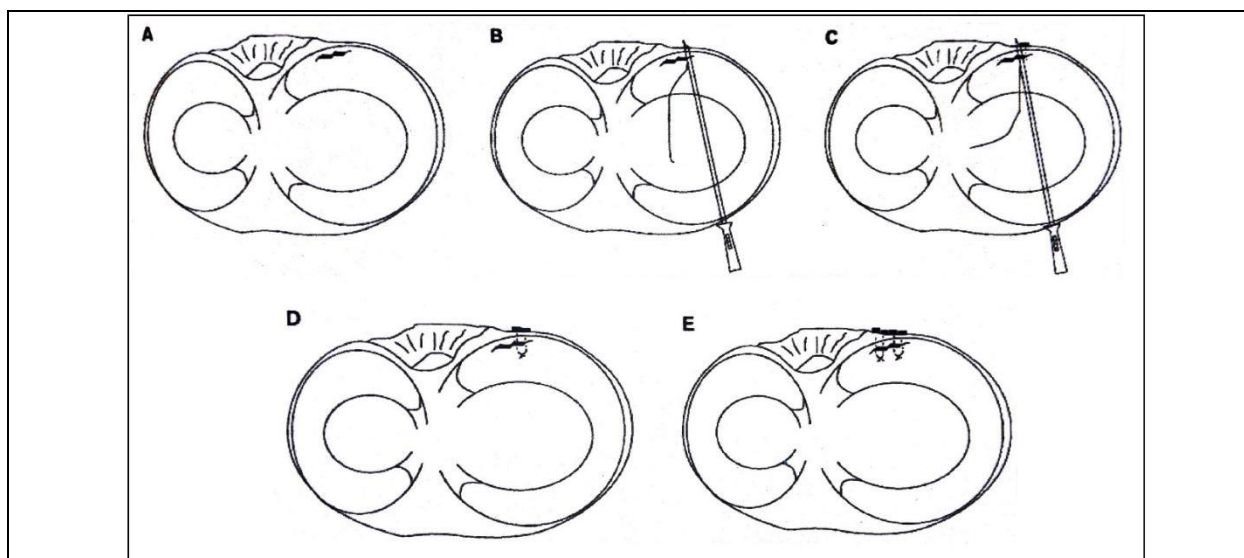


Figure 1: Meniscal injury and repair of the tear by ALL INSIDE technique. [A] longitudinal tear on the posterior horn identified, [B] A suturing device with self-locking knot system is passed through the tear site [C] after fixing the first bar on the joint capsule, the suturing device is passed to fix a second bar [D] the knot can slide and be cut with knot cutter [E] the horizontal sutures are performed with another suture device

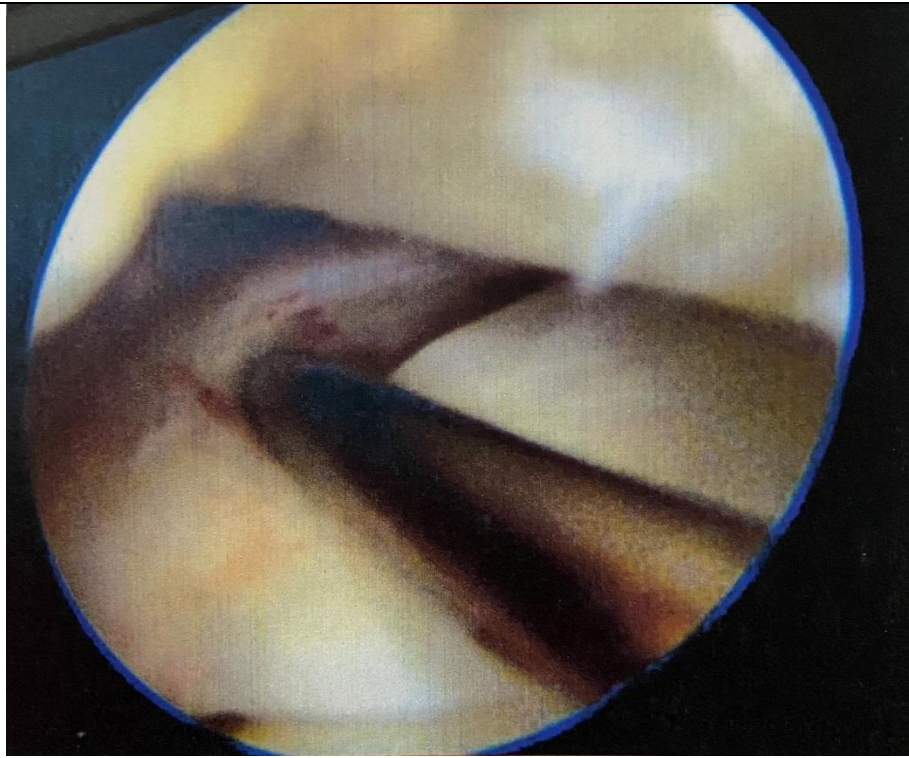


Figure 2. Shows tear in the posterior horn of the medial meniscus



Figure 3. Shows repair of the tear in the posterior horn of the media

Phase I (Surgery to 4 weeks after surgery)	
Rehabilitation goals	● Protection of the post-surgical knee

	<ul style="list-style-type: none"> • Restore normal knee extension • Eliminate effusion (swelling) • Restore leg control
Precautions	<ul style="list-style-type: none"> • The patient may gradually wean from two crutches to one crutch to no crutches as long as the knee is in the locked knee brace, and there is no increase in pain or swelling for 4 weeks. • Knee brace locked for all weight bearing activities for 4 weeks • Do not flex the knee past 90°
Range of motion exercises	<ul style="list-style-type: none"> • Knee extension on a bolster • Prone hangs • Supine wall slides • Heel slides (caution with posterior medial meniscus repair secondary to the semimembranosus insertion) • Knee flexion off the edge of the table
Suggested therapeutic exercise	<ul style="list-style-type: none"> • Quadriceps sets • Straight leg raises • 4-way leg lifts in standing with the brace on for balance and hip strength • Abdominal isometrics
Cardiovascular exercise	<ul style="list-style-type: none"> • Upper body circuit training or upper body ergometer
Progression criteria	<ul style="list-style-type: none"> • 4 weeks after surgery • Pain-free gait without crutches • No effusion (swelling)
Phase II (begin after meeting Phase I criteria, usually 4 weeks after surgery)	
Rehabilitation Goals	<ul style="list-style-type: none"> • Single leg stand control • Normalize gait • Good control and no pain with functional movements, including stepup/down, squat, partial lunge (between 0° and 60° of knee flexion)
Precautions	<ul style="list-style-type: none"> • No forced flexion with passive range of motion with knee flexion or weight bearing activities that push the knee past 60° of knee flexion • Avoid post-activity swelling • No impact activities
Suggested Therapeutic Exercise	<ul style="list-style-type: none"> • Non-impact balance and proprioceptive drills • Stationary bike • Gait drills • Hip and core strengthening • Stretching for patient-specific muscle imbalances • Quadriceps strengthening, making sure that closed chain exercises occur between 0 and 60° of knee flexion
Cardiovascular Exercise	<ul style="list-style-type: none"> • Non-impact endurance training: stationary bike, Nordic track, swimming, deep water running, or cross trainer
Progression Criteria	<ul style="list-style-type: none"> • Normal gait on all surfaces • Ability to carry out functional movements without unloading affected (injured) leg or pain, while demonstrating good control • Single leg balance greater than 15 seconds
Phase III (begin after meeting Phase II criteria, usually 3 months after surgery)	
Rehabilitation Goals	<ul style="list-style-type: none"> • Good control and no pain with sport and work specific movements, including impact
Precautions	<ul style="list-style-type: none"> • Post-activity soreness should resolve within 24 hours • Avoid post-activity swelling • Avoid posterior knee pain with end range knee flexion
Suggested Therapeutic Exercise	<ul style="list-style-type: none"> • Impact control exercises beginning 2 feet to 2 feet, progressing from 1 foot to the other and then foot to the same foot • Movement control exercises beginning with low velocity, single plane activities and progressing to higher velocity, multi-plane activities • Strength and control drills related to sport specific movements • Sport/work specific balance and proprioceptive drills • Hip and core strengthening • Stretching for patient-specific muscle imbalances
Cardiovascular Exercise	<ul style="list-style-type: none"> • Replicate sport or work specific energy demands
Return To Sport/Work	<ul style="list-style-type: none"> • Dynamic neuromuscular control with multi-plane activities without pain or swelling



Criteria
Table 1. Physiotherapy protocol by Marc Sherry, PT, DPT, LAT, CSCS and the UW Health Sports Medicine physician group

Modes of injury	Frequency	Percentage
Road traffic accident	12	52.2%
Slip	4	17.4%
Self-fall	3	13.0%
Vehicle climbing	1	4.3%
Fall from tree	1	4.3%
Football playing	1	4.3%
Twisting injury	1	4.3%

Table 2. shows various modes of meniscal injuries

Functional outcome at 6 weeks	Frequency	Percentages
Poor	0	0
Fair	22	95.7%
Good	1	4.3%
Excellent	0	0

Table 3. Descriptive analysis of functional outcome at 6 weeks (Lysholm scores)

Functional outcome at 9 weeks	Frequency	Percentages
Poor	0	0
Fair	12	52.2%
Good	11	47.8%
Excellent	0	0

Table 4. Descriptive analysis of functional outcome at 9 weeks (Lysholm scores)

Functional outcome at 12 weeks	Frequency	Percentages
Poor	0	0
Fair	0	0
Good	21	91.3%
Excellent	2	8.7%

Table 5. Descriptive analysis of functional outcome at 12 weeks (Lysholm scores)

Functional outcome at 12 months	Frequency	Percentages
Poor	0	0
Fair	0	0
Good	11	47.8%
Excellent	12	52.2%

Table 6. Descriptive analysis of functional outcome at 12 months (Lysholm scores)

Follow-up periods	Mean +/- SD	Mean difference	95%CI Lower	95%CI Upper	P value
6 weeks	72.17+/-6.83				
9 weeks	82.17+/-4.78	10.00	7.89	12.11	<0.001
12 weeks	88.04+/-3.18	15.87	13.48	18.26	<0.001
12 months	91.26+/-2.16	19.09	16.08	22.09	<0.001

Table 7. Comparison of mean of functional outcome score (Lysholm knee scoring scale) at 6,9,12 weeks and 12 months



DISCUSSION

A study was done by Ugur Tiftikçi and Sancar Serbest on 55 patients where the arthroscopic meniscal repair was performed. Lysholm's knee score improved significantly at the end of 29 months. In this study, we had very similar results following meniscal repairs. So, surgical repairs for meniscus with horizontal tears is advisable.^[10] Leonardo Jose Bernardes Albertoni et al studied 22 patients who underwent all inside meniscal repair technique and reported it as a safe and recommended procedure for meniscal tears in the red zone or red-white of the meniscus. In this study, we used a similar repair technique for meniscal tears which had similar significant results.^[11]

Arthroscopic meniscal repair showed better outcomes than meniscectomy. The incidence of osteoarthritis is much lesser with meniscal repairs. A study done by Alfonso Vaquero Picado and Carlos Rodriguez-Merchan can be compared with our study which has similar results.^[12] In Japan, Hisako Katano et al studied the patterns in isolated meniscus repair and meniscectomy on approximately 35000 patients. The meniscus repair ratio is gradually increasing compared to meniscectomy.^[13]

A study by P Beaufils and N Pujol about surgical repair of the injured meniscus and emphasized on saving meniscus rather than meniscectomy. A longitudinal vertical tear, posterior ramp lesions, traumatic tears at the root and radial lesions are also exceptional indications and show high achievement rates in terms of salvage time, functional outcome and cartilage safety.^[14]

CONCLUSION

The study concluded that arthroscopic meniscal repair is a very effective method of treating meniscal injuries. It gives painless knees postoperatively with a good range of movements and increased quality of life. Patients with simultaneous ACL reconstruction had a better outcome than an isolated Meniscal repair.

CONFLICTS OF INTEREST: None

REFERENCES

1. Fox AJS, Wanivenhaus F, Burge AJ, Warren RF, Rodeo SA. The human meniscus: a review of anatomy, function, injury, and advances in treatment. *Clin Anat N Y N*. 2015 Mar;28(2):269–87.
2. Anetzberger H, Birkenmaier C, Lorenz S. Meniscectomy: indications, procedure, outcomes, and rehabilitation. *Orthop Res Rev*. 2013 Dec 21;6:1–9.
3. Weber J, Koch M, Angele P, Zellner J. The role of

- meniscal repair for prevention of early onset of osteoarthritis. *J Exp Orthop*. 2018 Apr 2;5:10.
4. Zhang K, Li L, Yang L, Shi J, Zhu L, Liang H, et al. The biomechanical changes of load distribution with longitudinal tears of meniscal horns on knee joint: a finite element analysis. *J Orthop Surg*. 2019 Jul 25;14(1):237.
5. Patil SS, Shekhar A, Tapasvi SR. Meniscal Preservation is Important for the Knee Joint. *Indian J Orthop*. 2017;51(5):576–87.
6. Ro K-H, Kim J-H, Heo J-W, Lee D-H. Clinical and Radiological Outcomes of Meniscal Repair Versus Partial Meniscectomy for Medial Meniscus Root Tears: A Systematic Review and Meta-analysis. *Orthop J Sports Med*. 2020 Nov;8(11):2325967120962078.
7. Lin Y, Zhao J, Qiu H, Huang Y. All-inside versus inside-out suture techniques in arthroscopic meniscus repair: A prospective randomized study protocol. *Medicine (Baltimore)*. 2020 Jul 2;99(27):e20688.
8. Malinowski K, Góralczyk A, Hermanowicz K, LaPrade RF. Tips and Pearls for All Inside Medial Meniscus Repair. *Arthrosc Tech*. 2019 Feb;8(2):e131–9.
9. Mao DW, Lee YHD. All-inside Techniques for Meniscal Radial Root Tear Repair. *Arthrosc Tech*. 2020 Oct;9(10):e1541–5.
10. Tiftikçi U, Serbest S. Repair of isolated horizontal meniscal tears with all-inside suture materials using the verlock method: outcome study with a minimum 2-year follow-up. *J Orthop Surg*. 2016 Oct 28;11(1):131.
11. Albertoni LJB, Schumacher FC, Ventura MHA, da Silveira Franciozi CE, Debieux P, Kubota MS, et al. Meniscal repair by all-inside technique with Fast-Fix device. *Rev Bras Ortop*. 2013 Oct;48(5):448–54.
12. Vaquero-Picado A, Rodríguez-Merchán EC. Arthroscopic repair of the meniscus: Surgical management and clinical outcomes. *EFORT Open Rev*. 2018 Nov;3(11):584–94.
13. Katano H, Koga H, Ozeki N, Otabe K, Mizuno M, Tomita M, et al. Trends in isolated meniscus repair and meniscectomy in Japan, 2011-2016. *J Orthop Sci Off J Jpn Orthop Assoc*. 2018 Jul;23(4):676–81.
14. Beaufils P, Pujol N. Management of traumatic meniscal tear and degenerative meniscal lesions. Save the meniscus. *Orthop Traumatol Surg Res OTSR*. 2017 Dec;103(8S):S237–44.

