

## Assessment of Different Treatment Modalities of Meniscus Repair: An Observational Study

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Conflict of interest: Nil

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### Abstract

**Aim:** The objective of the present study was to compare clinical and functional results of meniscus repair treated with various modalities.

**Methods:** The present study was conducted and presenting in the Department of Orthopaedics, Netaji Subhas medical College and Hospital, Bihta, Patna, Bihar, India having meniscus injury identified on the basis of clinical examination and MRI findings, the patients were treated with meniscal repair techniques. The study population was made up of 20 knees with medial meniscal lesions and 30 knees with lateral meniscal lesions.

**Results:** This study represents a case series of 50 athletes who underwent repair of isolated meniscal lesions of the knee. Cases of discoid meniscal lesions and combined ligament injuries were excluded. The mean age of the patients was 22.9 years ranging from 12 to 50 years. The meniscal injury on right knee was 30 cases and left knee were 20. The most frequent type of tear in the medial meniscus group was the bucket handle tear that was seen in 8 of 20 knees (40%), while the most frequent type for the lateral meniscus group was the longitudinal tear that was seen in 12 of 30 knees (40%).

**Conclusion:** All meniscus repair techniques outside in, inside out, and all inside technique combination of all yields comparative clinical and functional outcome and statistically difference of result is not significant. Excellent to good results were in 99.66% cases.

**Keywords:** Meniscus, Repair, outside in, inside out, all inside, Hybrid technique

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### Introduction

Meniscal tears are the most frequently encountered and treated injuries in the knee joint, with a bimodal age distribution in young, active sports people and in elderly people, and with a relatively high annual cost. [1-3] Similarly, meniscal tear surgery is among the most commonly performed procedures in orthopaedic surgery. There are two menisci, which are medial (U-shaped) and lateral (S-shaped) semilunar shaped, hydrated, biphasic fibro

cartilaginous soft-tissue structures in the medial and lateral tibiofemoral compartments of the knee joint, respectively. They are not solely a separate structure; they are a part of the 'meniscus-meniscal ligament complex' together with the surrounding ligamentous structures (menisco-tibial, menisco-femoral, menisco-patellar, intermeniscal ligaments) and bony attachments as anterior and posterior roots. [4]

In surgical option for symptomatic meniscal tears, meniscal repair was conventionally indicated for tears within the vascular region without apparent degeneration of the meniscal substance while meniscectomy was indicated for the remaining “irreparable tear.” There have been several articles that comparatively examined the outcome of meniscectomy and meniscal repair. Praxton et al. [5] performed a metaanalysis that compared outcomes of those two procedures, and concluded that meniscal repair was associated with higher clinical score and less postoperative osteoarthritic progression in the long-term results while reoperation rate was higher after meniscal repair. Other studies also have shown better function and less osteoarthritis for meniscal repair compared with meniscectomy. [6,7]

When the study subject was limited to athletes, difference in the outcome between the two procedures is more distinct. Benneux et al. [8] noted postoperative arthritic (Fairbank's) changes in more than 90% of the patients after partial lateral meniscectomy for isolated lesions. In addition, although rare, severe complications such as rapid chondrolysis have been reported after partial meniscectomy in athletes. [9,10]

In an attempt to preserve the meniscus, they have expanded the indication for meniscal repair including tears in the avascular region and degenerative tears with use of fibrin clot [11] for healing enhancement since 2012. Healing rate and functional outcome after meniscal repair with fibrin clot supplementation in athletes have not been reported in previous literature.

Absorbable and non-absorbable anchors, arrows and staples have all been abandoned, due to poor solidity and cartilage impingement. hybrid systems associating suture (usually UHMWPE) and an absorbable or PEEK(polyether ether ketone) anchor, combine the qualities

of a minimally invasive implant and biomechanical properties comparable to those achieved with simple suture(considered as the gold-standard). fixation points are close together, every 5 to 7 mm, and preferably vertical rather than oblique or horizontal ; the most resistant part of meniscus is composed of horizontally distributed collagen fibers, so that a vertical suture has a better hold than a horizontal one. Abrasion is an essential step, and consists in abrading the fibrous tissue on the two edges of the meniscus to obtain bleeding tissue that is able to heal over. [12]

The objective of the present study was to compare clinical and functional results of meniscus repair treated with various modalities.

### **Materials and Methods**

The present study was conducted and presenting in the Department of Orthopaedics, Netaji Subhas medical College and Hospital, Bihta, Patna, Bihar, India having meniscus injury identified on the basis of clinical examination and MRI findings, the patients were treated with meniscal repair techniques. The study population was made up of 20 knees with medial meniscal lesions and 30 knees with lateral meniscal lesions.

### **Methodology**

Open repair is no longer indicated for vertical lesions, but may still be used in some very particular circumstances, notably in horizontal lesions in young athletes according to the location of injury. Results were taken from clinical and functional results at 3rd month, 6th month, 9th month and 1 year follow up.

Functional results were obtained on basis of the two follow up parameters:

1. Tegner lysholm knee scoring scale and
2. Tapper and Hoover System

### **Criteria**

Ages Eligible for Study 18 Years to 60 Years Adult)

Sexes Eligible for Study All

Accepts Healthy Volunteers No

### Screening Inclusion Criteria:

Subjects of either gender may be eligible for inclusion in the study only if they meet all of the following criteria:

Able and willing to give informed consent by voluntarily providing written informed consent in accordance with governing Institutional Review

### Surgical procedure

All surgeries were performed by the three senior authors under general anesthesia. We used a tourniquet for all cases. The inside-out technique was primarily used as the repair technique,<sup>11</sup> while the outside-in technique and the all-inside technique utilizing Fast-Fix (Smith & Nephew) were used alone or in conjunction with inside-out repair. A fibrin clot<sup>12</sup> was inserted and fixed to the capsule neighboring the repair site to enhance the meniscal healing in case of degenerative tears and tears in poorly vascularized region.

### Postoperative management

Postoperative treatment generally consisted of immobilization in extension with a brace and no weight bearing for the initial 3 weeks after surgery. Afterwards, range-of-motion exercises and partial weight-bearing was introduced with full weight-bearing beginning 4e5 weeks after

surgery. Running was permitted 3 months after surgery. At 5e6 months after surgery, the athletes were permitted to return to full athletic activity, provided recoveries of strength and neuromuscular coordination were confirmed.

### Clinical assessment

All assessments were performed by a single physician (H.N.). After surgery, the patients were followed-up periodically (at 3, 6, 9, and 12 months) for routine checkups. The clinical outcome was evaluated with validated subjective assessments (Lysholm and Tegner scores) preoperatively and at the final follow-up. We assessed the rate of return to play and postoperative time period before return to play (recovery time). Diagnosis of failed repair was based on clinical symptoms and signs suggestive of re-tear of the repaired meniscus. When the re-tear was clinically suspected, status of the healing at the repair site was assessed with MRI followed by repeat arthroscopy. In radiological evaluation, we compared the Rosenberg view radiographs before surgery and at 1 year for postoperative change in joint space width.<sup>13</sup>

### Statistical analysis

Differences in clinical parameters between the two groups were statistically assessed using the unpaired student's t-test with the significance level set at  $P < 0.05$ .

### Results

**Table 1: Demographics of study population**

Variable Study	N= 50
Age, (years)	22.9 ± 9.6 (range, 12-50)
<b>Sex, n (%)</b>	
Male	35 (70)
Female	15 (30)
<b>Side of Knee</b>	
Right Knee	30 (60)
Left Knee	20 (40)
<b>Side of tear, n (%)</b>	
Medial meniscus	16 (32)
Lateral meniscus	34 (68)
Follow-up period (months)	19.8 ± 6.8 (range, 12-30)

This study represents a case series of 50 athletes who underwent repair of isolated meniscal lesions of the knee. Cases of discoid meniscal lesions and combined ligament injuries were excluded. The mean age of the patients was 22.9 years ranging from 12 to 50 years. The meniscal injury on right knee was 30 cases and left knee were 20. The study population was made

up of 20 knees with medial meniscal lesions and 30 knees with lateral meniscal lesions. There were no significant differences in demographic and clinical characteristics between the groups. The mean follow-up period of all patients was  $19.8 \pm 6.8$  months (range; 12 months 33 months).

**Table 2: Profiles of tear types**

<b>Longitudinal tear</b>	<b>n</b>
Medical meniscus	4
Lateral meniscus	2
<b>Radial tear</b>	
Medical meniscus	1
Lateral meniscus	4
<b>Complex tear</b>	
Medical meniscus	5
Lateral meniscus	3
<b>Bucket handle tear</b>	
Medical meniscus	8
Lateral meniscus	8

The most frequent type of tear in the medial meniscus group was the bucket handle tear that was seen in 8 of 20 knees (40%), while the most frequent type for the lateral meniscus group was the longitudinal tear that was seen in 12 of 30 knees (40%).

**Table 3: Types of Meniscal Repaired with Different Techniques**

<b>Types of tears</b>	<b>Repair mechanisms</b>	<b>No. of cases</b>
Anterior horn tears	OUTSIDE IN	2
Posterior horn tears	ALL INSIDE	5
Middle third tears	All Inside + Inside Out	8
Bucket Handle tears	Hybrid (All inside, Inside out)	25
Bucket Handle tears	Hybrid(All inside, Inside out, outside in)	3
Radial tears	All Inside	5
Horizontal tears	All Inside	2

Out of 50 cases in our series of meniscal injury 2 cases of Anterior Hon tear repaired with outside in technique, 5 cases of Posterior horn tear repaired with All inside technique, 8 cases of middle third tear repaired with hybrid technique (All inside+inside out), 25 cases of bucket handle tear repaired with hybrid technique (all inside+ inside out), 3 cases of bucket handle tear repaired with hybrid technique (all inside +inside out +inside out+outside

in), 5 cases of radial tear repaired with All inside technique and 2 cases of horizontal tear repaired with all inside technique.

### Discussion

Treatment of Meniscal injuries has evolved from conservative management, open meniscectomy to closed partial arthroscopic meniscectomy and meniscus repair and meniscal transplantation. Arthroscopic meniscal repair has many

advantages in the treatment of meniscal injuries. In our study of 50 cases no study has shown statistically significantly data in view of complications and functional outcome. Arthroscopic meniscal repair is the treatment of choice for peripheral longitudinal meniscal tears in young patients. Today, there are three arthroscopic techniques for meniscus repair; the inside- out and outside-in suturing techniques and the all –inside technique, which uses biodegradable products and was developed originally by Albrecht-Olsen et al.in 1993.

The use of all –inside meniscal repair system has been increasing dramatically less demanding and easier for the surgeon in comparison with suturing methods. Arthroscopic meniscus repair along with a c l reconstruction in young adults yield good results. There are three principal techniques: All-inside, and inside out for middle third and posterior tears, and outside –in for more anterior locations. Inside –out repair is less and less used in Europe, as it involves posterior counter-incision, which may entail neurologic complications, especially in the medial compartment. Brian T. Sameulsen et al. reviewed comparative outcomes of all inside versus Inside Out repair of Bucket handle meniscal tears. Bucket handle meniscal tears continue to represent a significant challenge and meniscal preservation with repair is the preferred option over total or subtotal meniscectomy. [13]

The clinical success rate observed in this series of propensity-matched large bucket-handle meniscal tears was 80% for both all-inside repair and inside-out repair. This demonstrates that satisfactory clinical outcomes are achievable at short-term to midterm follow-up with both inside-out and all-inside repair of bucket-handle meniscal tears in rigorously matched patients with similar meniscal tear patterns. Increasing patient age trended toward a decreased clinical retear rate,

independent of the repair technique. Given the similar biomechanical profile between the repair methods, surgeons should utilize the device or technique that allows them to most reliably obtain anatomic reduction. In a study by Michael E. Hantes, arthroscopic meniscal repair a comparative study between three different surgical techniques outside-in in Inside Out and all inside technique there were no significant differences among the three groups concerning complications according to results arthroscopic meniscal repair with the Inside Out technique seems to be superior in comparison with other methods because it offers higher rate of meniscus healing without prolonged operation time. [14]

In the present study, we indicated meniscal repair even for tears with degeneration or insufficient vascularity. When the healing capability of the repaired meniscal tissue was deemed to be in question, fibrin clots were implanted to the repair site to enhance healing. Consequently, high rate of return to play (80%) was achieved, which was similar to the value reported in previous studies. Although the re-tear rate (8.7%) was low, this value may be an underestimation due to the short follow-up period (a minimum of 1 year). Previous long-term follow-up studies for longer than 5 years after inside-out meniscal repair for isolated meniscal lesions showed re-tear rates of 23.7%16 and 26.9%. [15]

In a study by Shirish Pathak et al., Functional outcomes of arthroscopic combined anterior cruciate ligament reconstruction and meniscal repair a retrospective analysis arthroscopic meniscal repair along with a c l reconstruction provided predictable high rates of meniscal healing and yielded favourable functional and clinical outcome patient selection remains one of the most important prognostic factors. [16] In a study by Hiroshi nakayama clinical outcome of meniscus repair for isolated meniscus tear in athletes, indication for

isolated meniscal repair in athletes the rate of satisfactory return to Sports was 91.3 percent in total during the follow-up period ranging from 12 to 33 months. The rate of the repaired site was encountered in 4 of the 46 knees (8.7%). [17]

In a study by C. Lutz et al., meniscectomy versus meniscal repair 10 years radiological and clinical results in vertical lesions in stable knee, at more than 10 year follow-up functional scores were significantly better with meniscal repair than meniscectomy on all parameters of the the KOOS scale except quality of life. Functional and radiological scores correlated closely. These results show that meniscal repair for vertical regions in stable knees protect against osteoarthritis and is therefore strongly recommended. [18]

Clinical and functional outcome results in our series excellent 60% good 30% 10% were fair. Arthroscopic meniscus repair reduces Hospital stay give early relief of symptoms low morbidity and patient returns to their work early with minimal complications hence arthroscopic meniscus repair is preferred treatment of choice for management of meniscus injuries. [19]

### Conclusion

All meniscus repair techniques outside in, inside out, and all inside technique combination of all yields comparative clinical and functional outcome and statistically difference of result is not significant. Excellent to good results were in 99.66% cases. Therefore, our priority should be to save the meniscus and restore the normal anatomy of the knee joint for its biomechanical stability and normal function.

### References

1. Baker BE, Peckham AC, Pupparo F, Sanborn JC. Review of meniscal injury and associated sports. *The American*

- journal of sports medicine.* 1985 Jan;13(1):1-4.
2. Clayton RA, Court-Brown CM. The epidemiology of musculoskeletal tendinous and ligamentous injuries. *Injury.* 2008 Dec 1;39(12):1338-44.
3. Mather III RC, Garrett WE, Cole BJ, Hussey K, Bolognesi MP, Lassiter T, Orlando LA. Cost-effectiveness analysis of the diagnosis of meniscus tears. *The American journal of sports medicine.* 2015 Jan;43(1):128-37.
4. Masouros SD, McDermott ID, Amis AA, Bull AM. Biomechanics of the meniscus-meniscal ligament construct of the knee. *Knee surgery, sports traumatology, arthroscopy.* 2008 Dec;16(12):1121-32.
5. Paxton ES, Stock MV, Brophy RH. Meniscal repair versus partial meniscectomy: a systematic review comparing reoperation rates and clinical outcomes. *Arthroscopy: the journal of arthroscopic & related surgery.* 2011 Sep 1;27(9):1275-88.
6. Xu C, Zhao J. A meta-analysis comparing meniscal repair with meniscectomy in the treatment of meniscal tears: the more meniscus, the better outcome? *Knee surgery, sports traumatology, arthroscopy.* 2015 Jan;23(1):164-70.
7. Lutz C, Dalmay F, Ehkirch FP, Cucurulo T, Laporte C, Le Henaff G, Potel JF, Pujol N, Rochcongar G, Salledechou E, Seil R. Meniscectomy versus meniscal repair: 10 years radiological and clinical results in vertical lesions in stable knee. *Orthopaedics & Traumatology: Surgery & Research.* 2015 Dec 1;101(8):S327-31.
8. Bonneux I, Vandekerckhove B. Arthroscopic partial lateral meniscectomy long-term results in athletes. *Acta orthopaedica belgica.* 2002 Oct 1;68(4):356-61.
9. Ishida K, Kuroda R, Sakai H, Doita M, Kurosaka M, Yoshiya S. Rapid chondrolysis after arthroscopic partial

- lateral meniscectomy in athletes: a case report. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2006 Dec; 14(12):1266-9.
10. Mariani PP, Garofalo R, Margheritini F. Chondrolysis after partial lateral meniscectomy in athletes. *Knee Surgery, Sports Traumatology, Arthroscopy*. 2008 Jun;16(6):574-80.
  11. Brown GC, Rosenberg TD, Deffner KT. Inside-out meniscal repair using zone-specific instruments. *The American Journal of Knee Surgery*. 1996 Jan 1;9(3):144-50.
  12. Arnoczky SP, Warren RF, Spivak JM. Meniscal repair using an exogenous fibrin clot. An experimental study in dogs. *The Journal of bone and joint surgery. American volume*. 1988 Sep 1 ;70(8):1209-17.
  13. Samuelsen BT, Johnson NR, Hevesi M, Levy BA, Dahm DL, Stuart MJ, Krych AJ. Comparative outcomes of all-inside versus inside-out repair of bucket-handle meniscal tears: a propensity-matched analysis. *Orthopaedic journal of sports medicine*. 2018 Jun 8;6(6):232596711 8779045.
  14. Hantes ME, Zachos VC, Varitimidis SE, Dailiana ZH, Karachalios T, Malizos KN. Arthroscopic meniscal repair: a comparative study between three different surgical techniques. *Knee surgery, sports traumatology, arthroscopy*. 2006 Dec;14(12):1232-7.
  15. Tengrootenhuysen M, Meermans G, Pittoors K, Van Riet R, Victor J. Long-term outcome after meniscal repair. *Knee surgery, sports traumatology, arthroscopy*. 2011 Feb;19(2):236-41.
  16. Pathak S, Bharadwaj A, Patil P, Raut S, Srikanth RV. Functional outcomes of arthroscopic combined anterior cruciate ligament reconstruction and meniscal repair: a retrospective analysis. *Arthroscopy, sports medicine, and rehabilitation*. 2020 Apr 1;2(2): e7 1-6.
  17. Nakayama H, Kanto R, Kambara S, Kurosaka K, Onishi S, Yoshiya S, Yamaguchi M. Clinical outcome of meniscus repair for isolated meniscus tear in athletes. *Asia-Pacific journal of sports medicine, arthroscopy, rehabilitation and technology*. 2017 Oct 1; 10:4-7.
  18. Lutz C, Dalmay F, Ehkirch FP, Cucurulo T, Laporte C, Le Henaff G, Potel JF, Pujol N, Rochcongar G, Salledechou E, Seil R. Meniscectomy versus meniscal repair: 10 years radiological and clinical results in vertical lesions in stable knee. *Orthopaedics & Traumatology: Surgery & Research*. 2015 Dec 1;101 (8):S327-31.
  19. Al-Rawee R., Al-Fathy D. M., & Bashir Alsabee D. W. Delivering Integrated Health Care: Role and Importance of Multidisciplinary Team Clinic Role and Importance of Multidisciplinary Team Clinic in Nineveh Province. *Journal of Medical Research and Health Sciences*. 2022; 5(10): 2278–2294.