



FUNCTIONAL OUTCOME OF ARTHROSCOPIC MENISCAL REPAIR BY ALL INSIDE AND INSIDE OUT TECHNIQUE A CLINICAL STUDY

Orthopaedics

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ABSTRACT

Background Of The Study: Meniscal tear occur in young adult Population commonly in Road traffic Accident and Sports related activities. With advement surrounding neurovascular structure, Inside-out Techniques remain standard of care. Advantages include a low implant cast and using a low-profile needle that allows multiple punctures without compromising the structural integrity of the meniscus but with risk of Neurovascular structure. **Aim Of The Study:** This study evaluated the Functional outcome of Arthroscopic Meniscus repair with all inside and inside-out techniques and identified the potential factors that meniscal repair with all inside and inside-out technique on the basis of Lysholm score. **Materials And Methods:** This study is a prospective observational clinical was conducted at Department of Orthopaedics Surgery Nehru hospital, B.R.D. Medical College Gorakhpur, U.P. after approval for Institute Ethical committee. All patients affected by menisci tear is surgically treated in the department from April 2023 to March 2024 were included in this study. The exclusion criteria included patients who had associated knee infection anterior cruciate ligament tear (ACL) posterior cruciate (PCL) injuries and Osteoarthritis of knee. **Results And Conclusion:** Out of 30 subjects; male and female comprised of 70 % and 30% of the subjects respectively. Hence there was male dominance in this study. Mean age among the study subjects was 24.7 ± 6.98 years with maximum 12 subjects from age group of 21-25 years (40%) followed by 10 patients of 26-30 years (33.3%). In this study, medial meniscus involved in 22 patients (73.3 %) and lateral meniscus in 8 patients (26.6%), red zone tear occurs in 19 patients (63.3%) and red white zone tear in 11 patients (36.7 %) inside Out repair done in 23 patients (76.66%) while All inside Repair done in 7 patients (23.33%) All -inside meniscal repair for treating meniscal tears has become the new treatment paradigm as it not only renders excellent functional outcomes with minimal complications but also prevents damage to the surrounding neurovasculature and the soft tissue envelope as it is a minimally invasive technique.

KEYWORDS

arthroscopic. Meniscus repair, anterior cruciate ligament tear, soft tissue, neurovasculature, Meniscal tears.

INTRODUCTION

Meniscal tears are common in young adults, typically resulting from road traffic accidents and sports-related activities. The menisci are essential fibrocartilaginous structures located on the medial and lateral sides of the knee, playing vital biomechanical roles in stabilizing the knee joint and acts as shock absorbers. These structures bear 40-70% of the weight across the knee, distributing the load to reduce stress on the tibia and maintain the knee joint articular congruency (1, 2). Meniscal tears have an estimated incidence rate of 60 per 100,000 individuals, with males being more frequently affected than females (3). They follow a bimodal age distribution: in younger individuals, injuries typically result from acute trauma, while degenerative changes are more common in older adults (4).

Meniscal injuries often occur in conjunction with anterior cruciate ligament (ACL) tears, with a co-occurrence rate of up to 82% in acutely injured ACLs and 96% in chronically deficient ACLs (5). The lateral meniscus, being more mobile with fewer attachments, is less prone to tears, while the medial meniscus, due to its limited mobility, is more susceptible (6). Symptoms of meniscal tears include localized pain along the joint line, swelling, clicking, and knee locking (7). MRI is the preferred imaging modality for evaluating and diagnosing meniscal tears (8).

Traditionally, meniscectomy (open or arthroscopic, partial or total) was the primary treatment for meniscal tears. However, due to the negative long-term outcomes of meniscal resection, such as early-onset osteoarthritis and compromised quality of life, meniscal repair has gained popularity. Meniscal repair techniques focus on preserving the remaining meniscus, with the choice of repair method influenced by factors like the type, size, and location of the tear, mechanism of injury, and patient-specific considerations (9).

The **inside-out technique** remains the standard of care for meniscal repair (10). It offers significant advantages, including low implant costs and the use of low-profile needles that allow for multiple punctures without compromising the structural integrity of the meniscus (11, 12). Despite advancements in techniques such as

outside-in and all-inside repairs, the inside-out technique continues to be preferred due to its superior biomechanical stability and effectiveness (13). With recent advancements, risks to surrounding neurovascular structures have been mitigated, further solidifying this technique's role in meniscal repair (14).

MATERIALS AND METHODS

During this study period, we were able to recruit 30 subjects. Out of them 22 belongs to medial menisci tears and 8 from lateral menisci tears. All young and middle age patients were participated with unilateral knee complains and history of trauma to the knee at department of Orthopedic emergency and outpatient department at B.R.D. medical college Gorakhpur, U.P. were examined by a thorough general and local examination of knee, in a relaxed and a supine position. The uninjured knee was examined first then injured knee. Each patient was clinically examined by McMurray, Thessaly, joint line tenderness and Apley grinding test. Then the findings were confirmed by magnetic resonance imaging and arthroscopy. All patients are given spinal anesthesia. Patients were position in OT table in supine position with Tourniquet application.

Radiograph of both knee in standing position in anteroposterior view and lateral view is taken. Magnetic resonance imaging (MRI) of the knee was done in all menisci tears case for confirmation.

X-Rays

Meniscal tear are not visible in plane x-rays. In some case secondary sign is seen such as soft tissue swelling near the meniscus when a meniscus cyst is present.

Magnetic Resonance Imaging (MRI)

MRI is the non-invasive imaging modality of choice when a meniscal tear is suspected. Under normal conditions, the meniscus appears as a uniform low-intensity signal on MRI. However, areas with increased signal intensity within the meniscus are considered abnormal and suggest the presence of a meniscal tear.

The grading scale for meniscal tears on MRI is as follows: Grade 0

indicates a normal meniscus; Grade 1 and 2 involve an intrameniscal signal that does not about the free edge of the meniscus; Grade 3 shows a signal change that abuts the free edge of the meniscus, which is indicative of a meniscal tear.

Operative Procedures:

For operative procedure patient written consent is taken, prophylactic intravenous antibiotic given the arthroscopic procedures were performed under spinal anesthesia tourniquet pressure of 320 mm hg applied after exsanguination of limb, an no 11 blade used to incise the skin and anterolateral portal is created 1 cm above the joint line and just next to patellar tendon with help of needle and in direct visualization anteromedial portal created 1 cm above the joint line and 1 cm medial to patellar tendon in a palpable soft spot. for inside out technique of medial meniscus repair vulgus force is applied to the flexed knee and lateral meniscus knee is placed in figure of 4 position and localized the tear, shaver is used to stimulate bleeding in red white zone and remove the adhesion and soft tissue. reduction of meniscus tear done with help of probe, to start passing the suture knee is positioned in 20 to 30 degree of flexion and meniscal needle is advanced through the superior or inferior aspect of meniscus and capsule is penetrated with help of second needle of suture a self-delivery gun fitted with canola (sharpshooter) is used to pass double loaded non absorbable suture (no 2 fiber wire Arthrex) into the meniscus to start passing the suture, the knee is positioned into 20 to 30 degree of flexion and meniscal needle is advanced through the superior and inferior aspect of meniscus and corresponding portion of meniscus is penetrated. The knee can be flexed to 70 to 90 to help with retrieval the needle the needle are cut from suture and sliding knot is placed, the same process is repeated adjacent to previous suture with suture in both the superior and inferior border of menisci 3 to 5 mm apart lastly knee in 90 degree of flexion all suture are tied taking care not over tightened the tissue. In all inside meniscal repair AIR+ Stryker is used, after reduction of meniscus tear with probe, AIR+ is inserted through cannula and 17 gauge meniscus needle inserted and anchor is deployed by pushing down the plunger through the meniscus and capsule and tighten of knot done and suture cut and 2nd suture taken in this manner.

Statistical Analysis:

Data so collected was tabulated in an excel sheet, under the guidance of statistician. The means and standard deviations of the measurements per group were used for statistical analysis (SPSS 25.00 for windows; SPSS inc, Chicago, USA). Difference between two groups was determined using t test as well as chi square test and the level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Out of 30 subjects; male and female comprised of 70 % and 30% of the subjects respectively. Hence there was male dominance in this study. male dominance occurs due to more road traffic accident and more participate in sport activity as compared to female (Table 1).

Table 1: Gender And Age Distribution Among The Study Subjects

Gender distribution		
Gender	N	%
Male	21	70
Female	9	30
Total	30	100
Age distribution		
Age Group (in years)	N	%
18-20	5	16.66
21-25	12	40
26-30	10	33.33
>30	3	10
Total	30	100
Mean±SD	24.7±6.98	

Mean age among the study subjects was 24.7±3.86 years with maximum subjects from age group of 21-25 years (40 %) followed by 26-30 years (33.33%) as shown in table 1.

Table 2: Side Of Injury And Technique Used Among The Study Subjects

Side of injury		
Side	N	%
Right	19	63.3
Left	11	36.6

Total	30	100
Technique used		
Technique	N	%
Inside out repair	23	76.66
All inside	7	23.33
Total	30	100

Injuries were reported more on right side (63.3%) as compared to left side (36.6%), surgical technique used was Inside out repair and all inside among 76.66 % and 23.33% of the subjects respectively (table 2).

Table 3: Mode Of Injury And Diagnosis Among The Study Subjects

Mode of injury	N	%
RTA	14	46.66
Sports Injury	10	33.33
Fall from height	4	13.33
Direct blow	2	6.66
Total	30	100
Diagnosis		
	N	%
Longitudinal tear of medial meniscus	11	36.66
Bucket Handle Tear of medial Meniscus	8	26.66
Horizontal tear medial meniscus	3	10
Longitudinal tear lateral meniscus	4	13.33
Oblique tear lateral meniscus	2	6.66
Horizontal tear lateral meniscus	2	6.66
Total	30	100

Mode of injury viz. RTA, sports injury, fall from height and direct blow was revealed in 46.66%, 33.33%, 13.33% and 6.66% of the subjects respectively (table 3).

Table 4: Side And Co-morbidity Among The Study Subjects

Side	N	%
MEDIAL MENISCUS	22	73.33
LATERAL MENISCUS	08	26.66
TOTAL	30	100
Co-morbidity		
	N	%
Hypertension	4	13.3
Diabetes mellitus	3	10
No	23	76.7
Total	30	100

Hypertension was reported among 13.3% & Diabetes mellitus were 10% of the subjects.

Table 5: Duration Of Surgery (in Min) And Hospital Stay (in Days) Among The Study Subjects

Among the Study Subjects		
Duration of surgery (in min)	N	%
25-30	8	26.7
31-40	10	33.3
41-50	6	20
51-60	5	16.7
61-65	1	3.3
Total	30	100
Mean±SD	42.93±13.34	
Duration of Hospital stay (in days)	N	%
3	9	30
4	16	53.3
5	5	16.7
Total	30	100
Mean±SD	3.97±0.56	

Mean duration of surgery among the study subjects was 42.93±13.34 minutes. Only in 5 cases, surgical duration was more than 50 minutes (table 5). Mean duration of hospital stay (in days) among the study subjects was 3.97±0.56 minutes. Most of the subjects discharged from the hospital within 4 days of surgery (table 5).

Table 6: Lysholm Scores At Baseline And Final Followup

Surgery Outcome	Baseline		Final Follow-up	
	N	%	N	%
Total	30	100	0	0
Poor	30	100	4	13.3
Fair	0	0	9	30

Good	0	0	10	33.3
Excellent	0	0	7	23.3
Mean $\pm$ SD	41.93 $\pm$ 11.73		88.68 $\pm$ 7.32	
p value	<0.01*			

At baseline, all the subjects had poor Lysholm scores. After surgery and at final follow-up; 23.3 % of the subjects had excellent Lysholm scores while 33.33 % and 30 % of the subjects had good and fair Lysholm scores respectively. Mean Lysholm scores at baseline and final follow-up was 41.93 $\pm$ 11.73 and 88.68 $\pm$ 7.32 respectively with statistically significant difference as $p < 0.05$ (table 6).

CONCLUSION

This prospective observational clinical study was conducted at the Department of Orthopaedic Surgery, Nehru Hospital, B.R.D. Medical College, Gorakhpur, U.P., among 30 patients diagnosed with meniscal tears and surgically treated between April 2023 and March 2024. Diagnosis was made based on clinical and radiological evaluations, confirmed through arthroscopic and MRI imaging techniques. The aim was to evaluate the functional outcomes of arthroscopic meniscal repair using both the all-inside and inside-out techniques.

The Key Findings From The Study Are As Follows:

- 1) The study showed a male predominance, with 70% male patients, resulting in a male-to-female ratio of 2.3:1.
- 2) The mean age of participants were 24.7 $\pm$ 6.98 years, with the largest group (40%) falling in the 21-25 year age range, followed by 33.3% in the 26-30 years range.
- 3) Injuries were more common on the right side (63.68%) than the left side (36.32%).
- 4) The inside-out surgical technique was used in 76% of the cases, while the all-inside technique was employed in 24%.
- 5) The most common modes of injury were road traffic accidents (48%), sports injuries (28%), falls from height (16%), and direct blows (8%).
- 6) Comorbidities such as hypertension and diabetes were reported in 13% and 10% of the patients, respectively.
- 7) The average duration of surgery was 42.93 $\pm$ 13.34 minutes, with only five surgeries exceeding 50 minutes.
- 8) The mean duration of hospital stay were 3.97 $\pm$ 0.56 days, with most patients being discharged within four days.
- 9) At baseline, all subjects had poor Lysholm scores, but after surgery, 40% of the patients had excellent scores, 44% had good scores, and 16% had fair scores. The mean Lysholm score significantly improved from 41.93 $\pm$ 11.73 at baseline to 88.68 $\pm$ 7.32 at final follow-up, with a statistically significant difference ($p < 0.05$).
- 10) Postoperative complications occurred in 16.6% of the patients, with quadriceps wasting in 2 patients (6.4%), surgical failure in 2 patients (6.4%), and retear due to trauma in 1 patients (3.2%).
- 11) The meniscus plays a crucial role in shock absorption, joint stability and maintain joint Congruency. The patients who underwent arthroscopic meniscal repair with either technique showed significant improvements in functional outcomes and a low revision rate at the 9-month follow-up, with no major adverse events.

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