

Research Article

Functional Outcomes of Arthroscopic Meniscal Repair versus Partial Meniscectomy in Traumatic Meniscal Tears

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ABSTRACT

Background: Traumatic meniscal tears commonly cause knee pain and functional impairment. Arthroscopic meniscal repair and partial meniscectomy are widely performed surgical procedures.

Objective: To compare functional outcomes following arthroscopic meniscal repair and partial meniscectomy in patients with traumatic meniscal tears.

Materials and Methods: This prospective comparative study included 140 patients, divided equally into meniscal repair (n = 70) and partial meniscectomy (n = 70) groups. Functional outcomes were assessed using IKDC and Lysholm knee scores preoperatively and during 12 months of follow-up.

Results: Both groups demonstrated functional improvement. Mean IKDC scores increased from 42.6 ± 9.4 to 90.6 ± 7.2 following repair and from 43.1 ± 9.1 to 85.2 ± 8.1 following meniscectomy. Lysholm scores improved from 48.5 ± 10.6 to 93.2 ± 6.4 and from 49.2 ± 10.2 to 88.1 ± 7.5 , respectively. Partial meniscectomy showed faster early recovery, whereas meniscal repair demonstrated higher scores at 12 months. Return to pre-injury activity was achieved in 85.7% and 72.9% of patients, respectively.

Conclusion: Both procedures improved knee function, while meniscal repair showed more favourable functional outcomes at 12 months.

Keywords: Meniscal Repair, Partial Meniscectomy, Traumatic Meniscal Tear, IKDC, Lysholm Score.

INTRODUCTION

Meniscal tears are among the most common intra-articular knee injuries, particularly affecting young and physically active individuals. These injuries frequently result from sports-related activities, twisting movements, and rotational trauma, leading to pain, swelling, mechanical symptoms, and functional limitations[1]. The menisci play an essential role in load transmission, shock absorption, joint stability, and protection of articular cartilage. Disruption of meniscal integrity alters normal knee biomechanics, increases stress on articular surfaces, and predisposes individuals to progressive cartilage degeneration and early-onset osteoarthritis. Therefore, appropriate management of traumatic meniscal tears is essential for

restoring knee function and preventing long-term complications [2].The surgical management of meniscal injuries has evolved considerably, with increasing emphasis on preserving meniscal tissue. Historically, meniscectomy was widely performed for symptomatic meniscal tears because of its effectiveness in relieving pain and mechanical symptoms. However, biomechanical studies demonstrated that meniscal removal reduces the tibiofemoral contact area and increases contact stresses, thereby accelerating degenerative changes. These findings have encouraged a shift toward meniscus-preserving procedures, particularly in younger patients with traumatic injuries and greater functional demands [3,4].Arthroscopic partial meniscectomy remains an established

treatment for meniscal tears unsuitable for repair. The procedure involves selective removal of damaged meniscal tissue while preserving the remaining healthy portion. Its advantages include technical simplicity, shorter operative duration, early mobilization, and faster return to routine activities. However, despite satisfactory short-term functional improvement, partial meniscectomy may compromise the load-distributing capacity of the meniscus and increase the risk of long-term cartilage degeneration and osteoarthritis [4,5]. In contrast, arthroscopic meniscal repair aims to restore the anatomical integrity and biomechanical function of the injured meniscus. Advances in arthroscopic techniques, including inside-out, outside-in, and all-inside repair methods, have improved the feasibility of meniscal preservation. Repair is particularly suitable for traumatic tears involving peripheral vascular regions with greater healing potential. Although meniscal repair may preserve joint stability and reduce degenerative changes, it generally requires prolonged rehabilitation and carries a risk of incomplete healing, recurrent tears, or subsequent surgical intervention [6,7]. Previous studies have reported favourable outcomes following both procedures. Stein et al. demonstrated better preservation of knee joint integrity and higher rates of return to pre-injury activity levels following meniscal repair compared with partial meniscectomy [8]. Similarly, Migliorini et al., in a meta-analysis, reported that meniscal repair was associated with a lower risk of advanced osteoarthritis and subsequent knee arthroplasty [9]. However, Paxton et al. reported differences in reoperation rates and clinical outcomes between meniscal repair and partial meniscectomy, emphasizing the importance of considering both functional improvement and treatment durability [10]. Functional outcomes following arthroscopic treatment are commonly assessed using validated scoring systems, including the International Knee Documentation Committee (IKDC) subjective knee evaluation form, Lysholm Knee Scoring Scale, and Tegner Activity Scale. These instruments assess pain, knee function, stability, and return to pre-injury activities. Although partial meniscectomy may provide faster early recovery, meniscal repair offers potential long-term benefits through tissue preservation. Nevertheless, differences in postoperative functional recovery remain clinically relevant. Therefore, the present study aimed to compare the functional outcomes of arthroscopic meniscal repair versus partial

meniscectomy in patients with traumatic meniscal tears to determine their relative effectiveness and guide appropriate surgical management.

MATERIALS AND METHODS

This prospective comparative study was conducted in the Department of Orthopaedics at a tertiary care hospital over a period of 18 months. Patients diagnosed with traumatic meniscal tears and requiring arthroscopic surgical intervention were enrolled. A total of 140 patients with traumatic meniscal tears were included and divided into two groups based on the surgical procedure performed:

- Group A (n = 70): Patients who underwent arthroscopic meniscal repair.
- Group B (n = 70): Patients who underwent arthroscopic partial meniscectomy.

Inclusion Criteria

1. Patients aged 18–60 years.
2. Patients with MRI-confirmed traumatic meniscal tears.
3. Patients with symptomatic meniscal tears requiring arthroscopic intervention.
4. Patients who provided written informed consent and agreed to follow-up.

Exclusion Criteria

1. Patients with degenerative meniscal tears.
2. Patients with advanced knee osteoarthritis.
3. Patients with previous surgery on the affected knee.
4. Patients with associated fractures or multiligament knee injuries.
5. Patients with inflammatory arthritis or active knee infection.
6. Patients unwilling to participate or complete follow-up.

Preoperative Assessment

All patients underwent detailed history-taking, clinical examination, and MRI evaluation of the affected knee. Demographic characteristics, mechanism of injury, duration of symptoms, tear location, and associated injuries were recorded. Clinical assessment included joint line tenderness, range of motion, McMurray's test, and knee stability. Preoperative functional status was evaluated using the International Knee Documentation Committee (IKDC) subjective knee score and Lysholm Knee Scoring Scale.

Surgical Procedure

All procedures were performed arthroscopically using standard anteromedial and anterolateral

portals. Diagnostic arthroscopy was performed to assess tear morphology, location, and tissue quality. In Group A, arthroscopic meniscal repair was performed using all-inside, inside-out, or outside-in techniques according to tear characteristics. The torn meniscal edges were approximated and secured using appropriate sutures or repair devices. In Group B, arthroscopic partial meniscectomy was performed by removing unstable or irreparable meniscal fragments while preserving the maximum possible healthy meniscal tissue.

Postoperative Rehabilitation

All patients received standard postoperative analgesia, wound care, and physiotherapy. Patients undergoing partial meniscectomy were encouraged to begin early mobilization and progressive weight-bearing as tolerated. Patients undergoing meniscal repair followed a protected rehabilitation protocol with initial restrictions on weight-bearing and knee flexion. Progressive strengthening and functional exercises were introduced according to clinical recovery.

Follow-up and Outcome Assessment

Patients were evaluated preoperatively and at 6 weeks, 3 months, 6 months, and 12 months postoperatively. Functional outcomes were assessed using IKDC and Lysholm knee scores. Knee range of motion, postoperative complications, recurrent symptoms, and requirement for reoperation were also recorded. The primary outcome was the comparison of functional scores between the two groups at 12 months.

Statistical Analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics software. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequencies and percentages. Normality was assessed using the Shapiro–Wilk test. The independent samples t-test or Mann–Whitney U test was used for between-group comparisons, while the paired t-test or Wilcoxon signed-rank test was used for within-group comparisons. Categorical variables were compared using the Chi-square test or Fisher's exact test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 140 patients were included in the study, with 70 patients each undergoing

meniscal repair and partial meniscectomy. The majority of patients belonged to the 18–30-year age group (40.0% versus 34.3%), with male predominance in both groups (70.0% versus 65.7%). Normal BMI was observed in 54.3% and 50.0% of patients, while right knee involvement was reported in 55.7% and 52.9%, respectively. No statistically significant differences were observed in age, sex, BMI, or affected knee between the groups (all $p > 0.05$) (Table 1). Sports-related injuries were the most common mechanism of injury (51.4% versus 44.3%), while medial meniscal involvement predominated in both groups (65.7% versus 68.6%). Mechanism of injury, symptom duration, and meniscus involved were comparable between groups (all $p > 0.05$). However, tear morphology differed significantly ($p < 0.001$), with longitudinal vertical tears more frequent in the repair group (50.0%) and complex tears more common in the meniscectomy group (38.6%) (Table 2). Preoperative IKDC scores were comparable between the meniscal repair and partial meniscectomy groups (42.6 ± 9.4 versus 43.1 ± 9.1 ; $p = 0.750$). Partial meniscectomy demonstrated significantly higher scores at six weeks (62.4 ± 9.8 versus 55.8 ± 10.2 ; $p < 0.001$) and three months (73.6 ± 9.4 versus 69.2 ± 9.6 ; $p = 0.007$). However, at 12 months, meniscal repair demonstrated significantly better functional outcomes (90.6 ± 7.2 versus 85.2 ± 8.1 ; $p < 0.001$), with mean improvements of 48.0 and 42.1 points, respectively (Table 3). Baseline Lysholm scores were comparable between groups (48.5 ± 10.6 versus 49.2 ± 10.2 ; $p = 0.691$). Partial meniscectomy showed significantly higher scores at six weeks (68.2 ± 9.5 versus 60.4 ± 9.8 ; $p < 0.001$) and three months (79.4 ± 8.8 versus 74.6 ± 9.2 ; $p = 0.002$). At 12 months, meniscal repair achieved significantly higher scores (93.2 ± 6.4 versus 88.1 ± 7.5 ; $p < 0.001$), with mean improvements of 44.7 and 38.9 points, respectively (Table 4 and Figure 1). At 12 months, excellent Lysholm outcomes were more frequent following meniscal repair than partial meniscectomy (50.0% versus 31.4%; overall outcome-category comparison $p = 0.022$). Return to pre-injury activity was higher following repair (85.7% versus 72.9%; $p = 0.061$). Persistent knee pain (7.1% versus 14.3%), recurrent meniscal symptoms (5.7% versus 10.0%), and reoperation (4.3% versus 7.1%) were less frequent following repair, although these differences were not statistically significant (all $p > 0.05$) (Table 5 and Figure

2).Spearman correlation analysis demonstrated significant negative correlations of age ($p = -0.284$ and -0.261), BMI ($p = -0.218$ and -0.236), and symptom duration ($p = -0.342$ and -0.315) with 12-month IKDC and Lysholm scores, respectively (all $p < 0.05$).However, preoperative IKDC scores showed positive correlations with postoperative IKDC ($p = 0.428$) and Lysholm scores ($p = 0.386$), while

preoperative Lysholm scores were positively correlated with postoperative IKDC ($p = 0.394$) and Lysholm scores ($p = 0.452$), all $p < 0.001$. These findings suggest that younger age, lower BMI, shorter symptom duration, and better baseline functional status were associated with superior 12-month functional outcomes (Table 6 and Figure 3).

Table 1. Comparison of Demographic Characteristics between the Two Groups

Parameter	Meniscal Repair (n = 70)	Partial Meniscectomy (n = 70)	p-value	Statistical test
Age group (years)			0.905	Chi-square
18–30	28 (40.0%)	24 (34.3%)		
31–40	24 (34.3%)	25 (35.7%)		
41–50	13 (18.6%)	15 (21.4%)		
51–60	5 (7.1%)	6 (8.6%)		
Sex			0.587	Chi-square
Male	49 (70.0%)	46 (65.7%)		
Female	21 (30.0%)	24 (34.3%)		
BMI category (kg/m ²)			0.807	Chi-square
Normal (18.5–24.9)	38 (54.3%)	35 (50.0%)		
Overweight (25–29.9)	26 (37.1%)	27 (38.6%)		
Obese (≥ 30)	6 (8.6%)	8 (11.4%)		
Affected knee			0.734	Chi-square
Right	39 (55.7%)	37 (52.9%)		
Left	31 (44.3%)	33 (47.1%)		

Table 2. Comparison of Clinical and Meniscal Tear Characteristics

Parameter	Meniscal Repair (n = 70)	Partial Meniscectomy (n = 70)	p-value	Statistical test
Mechanism of injury			0.695	Chi-square
Sports-related injury	36 (51.4%)	31 (44.3%)		
Road traffic accident	17 (24.3%)	19 (27.1%)		
Twisting injury	17 (24.3%)	20 (28.6%)		
Duration of symptoms			0.784	Chi-square
Less than 3 months	30 (42.9%)	26 (37.1%)		
3–6 months	25 (35.7%)	27 (38.6%)		
More than 6 months	15 (21.4%)	17 (24.3%)		
Meniscus involved			0.719	Chi-square
Medial meniscus	46 (65.7%)	48 (68.6%)		
Lateral meniscus	24 (34.3%)	22 (31.4%)		
Tear morphology			<0.001	Chi-square
Longitudinal vertical	35 (50.0%)	11 (15.7%)		
Bucket-handle	20 (28.6%)	12 (17.1%)		

Radial	8 (11.4%)	20 (28.6%)		
Complex	7 (10.0%)	27 (38.6%)		

Table 3. Comparison of IKDC Functional Scores at Different Follow-Up Intervals

Assessment period	Meniscal Repair (n = 70), Mean $\pm$ SD	Partial Meniscectomy (n = 70), Mean $\pm$ SD	p-value	Statistical test
Preoperative	42.6 $\pm$ 9.4	43.1 $\pm$ 9.1	0.750	Welch's t-test
6 weeks	55.8 $\pm$ 10.2	62.4 $\pm$ 9.8	<0.001	Welch's t-test
3 months	69.2 $\pm$ 9.6	73.6 $\pm$ 9.4	0.007	Welch's t-test
6 months	82.4 $\pm$ 8.5	80.1 $\pm$ 8.9	0.120	Welch's t-test
12 months	90.6 $\pm$ 7.2	85.2 $\pm$ 8.1	<0.001	Welch's t-test
Improvement from baseline to 12 months	+48.0	+42.1	Not calculable	Paired data required

Table 4. Comparison of Lysholm Knee Scores at Different Follow-Up Intervals

Assessment period	Meniscal Repair (n = 70), Mean $\pm$ SD	Partial Meniscectomy (n = 70), Mean $\pm$ SD	p-value	Statistical test
Preoperative	48.5 $\pm$ 10.6	49.2 $\pm$ 10.2	0.691	Welch's t-test
6 weeks	60.4 $\pm$ 9.8	68.2 $\pm$ 9.5	<0.001	Welch's t-test
3 months	74.6 $\pm$ 9.2	79.4 $\pm$ 8.8	0.002	Welch's t-test
6 months	86.8 $\pm$ 7.9	84.1 $\pm$ 8.3	0.051	Welch's t-test
12 months	93.2 $\pm$ 6.4	88.1 $\pm$ 7.5	<0.001	Welch's t-test
Improvement from baseline to 12 months	+44.7	+38.9	Not calculable	Paired data required

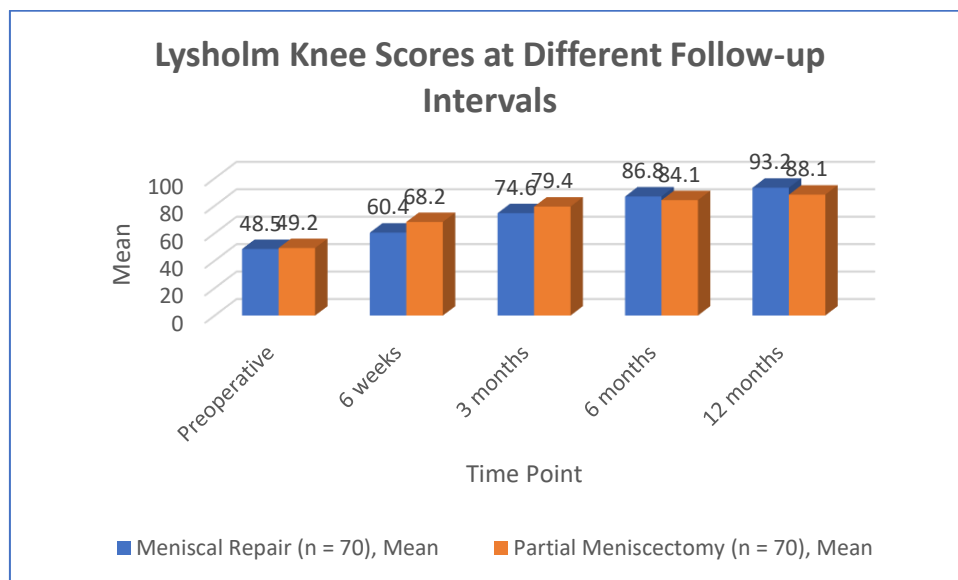


Figure 1. Comparison of Lysholm Knee Scores at Different Follow-Up Intervals

Table 5. Comparison of Functional Outcomes and Postoperative Complications at 12 Months

Parameter	Meniscal Repair (n = 70)	Partial Meniscectomy (n = 70)	p-value	Statistical test
Lysholm outcome category			0.022	Chi-square
Excellent (95–100)	35 (50.0%)	22 (31.4%)		
Good (84–94)	29 (41.4%)	32 (45.7%)		

Fair (65–83)	6 (8.6%)	16 (22.9%)		
Poor (less than 65)	0 (0.0%)	0 (0.0%)		
Return to pre-injury activity			0.061	Chi-square
Yes	60 (85.7%)	51 (72.9%)		
No	10 (14.3%)	19 (27.1%)		
Postoperative complications				
Persistent knee pain	5 (7.1%)	10 (14.3%)	0.274	Fisher's exact
Recurrent meniscal symptoms	4 (5.7%)	7 (10.0%)	0.532	Fisher's exact
Knee stiffness	4 (5.7%)	3 (4.3%)	1.000	Fisher's exact
Superficial infection	1 (1.4%)	1 (1.4%)	1.000	Fisher's exact
Reoperation	3 (4.3%)	5 (7.1%)	0.718	Fisher's exact

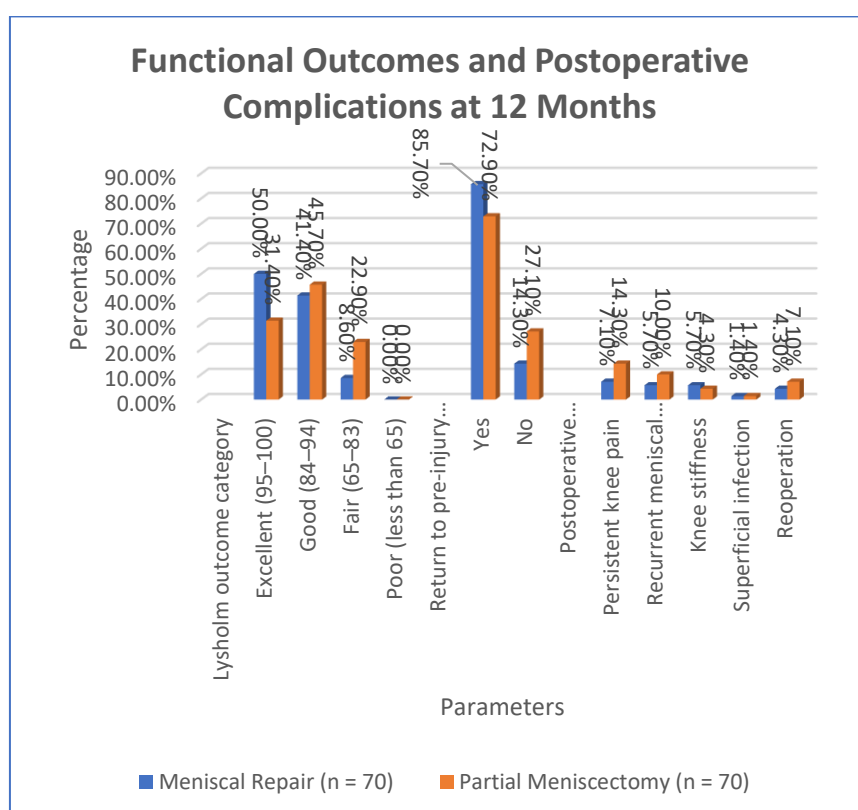


Figure 2. Comparison of Functional Outcomes and Postoperative Complications at 12 Months

Table 6. Correlation of Patient and Injury Characteristics with 12-Month Functional Outcomes (N = 140)

Variable	IKDC Score, Spearman's ρ	p-value	Lysholm Score, Spearman's ρ	p-value	Statistical test
Age (years)	−0.284	0.001	−0.261	0.002	Spearman correlation
BMI (kg/m ²)	−0.218	0.010	−0.236	0.005	Spearman correlation
Duration of symptoms (months)	−0.342	<0.001	−0.315	<0.001	Spearman correlation
Preoperative IKDC score	0.428	<0.001	0.386	<0.001	Spearman correlation
Preoperative Lysholm score	0.394	<0.001	0.452	<0.001	Spearman correlation

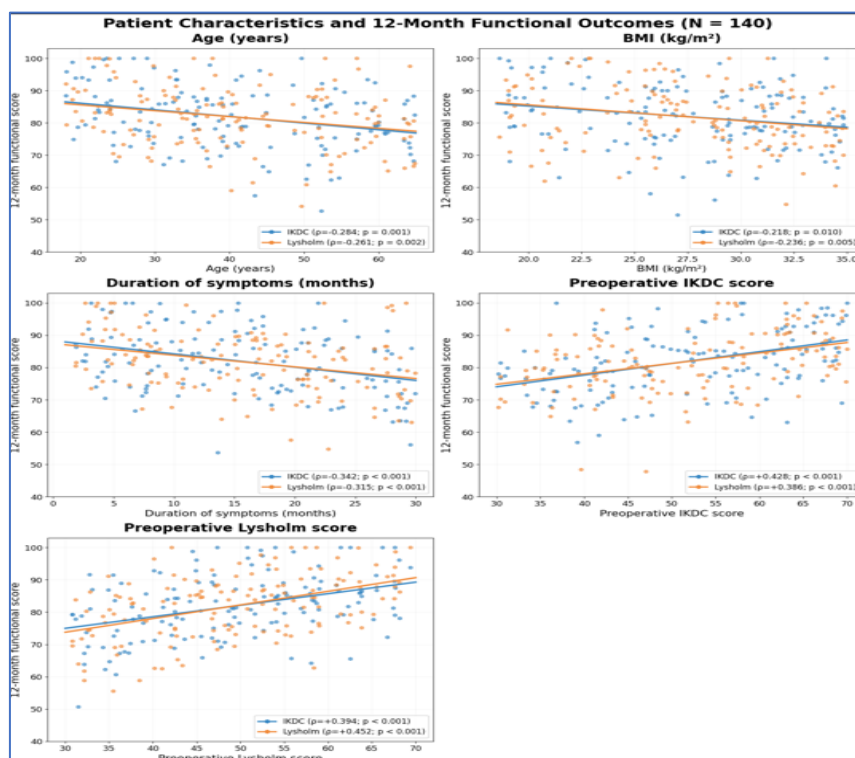


Figure 3. Correlation of Patient and Injury Characteristics with 12-Month Functional Outcomes (N = 140)

DISCUSSION

In the present study, 140 patients were included, with 70 patients each undergoing arthroscopic meniscal repair and partial meniscectomy. Most patients were aged 18–40 years (74.3% and 70.0%, respectively), with male predominance (70.0% and 65.7%). Rockborn and Messner [11] evaluated 60 patients, including 30 who underwent meniscal repair and 30 who underwent meniscectomy, and demonstrated satisfactory long-term functional outcomes following both procedures. Their findings supported the effectiveness of surgical management in appropriately selected patients with meniscal injuries. Sports-related injuries were the most common mechanism of injury, accounting for 51.4% of the repair group and 44.3% of the meniscectomy group. Medial meniscal tears predominated in both groups (65.7% and 68.6%). Longitudinal tears were more frequent in the repair group (50.0%), whereas complex tears predominated in the meniscectomy group (38.6%). Henning et al. [12] investigated fascia sheath coverage and fibrin clot augmentation for complex meniscal tears and reported improvement in healing rates from approximately 75% to 92% in selected tear configurations. Similarly, Sethi et al. [13] described an in situ fibrin clot technique to promote meniscal healing. These studies emphasized the importance of tear morphology

and biological healing potential in surgical management.

Both groups demonstrated substantial postoperative functional improvement. The mean IKDC score increased from 42.6 ± 9.4 to 90.6 ± 7.2 following meniscal repair and from 43.1 ± 9.1 to 85.2 ± 8.1 following partial meniscectomy at 12 months. Similarly, Lysholm scores improved from 48.5 ± 10.6 to 93.2 ± 6.4 and from 49.2 ± 10.2 to 88.1 ± 7.5 , respectively. Rockborn and Messner [11], in their 13-year follow-up study, reported that approximately 90% of patients in both groups experienced no knee problems during daily activities, without significant differences in overall knee function. Their findings were consistent with the favourable functional recovery observed following both procedures, although the present results suggested higher 12-month scores following meniscal repair. Partial meniscectomy demonstrated faster early functional recovery, with higher IKDC scores at 6 weeks (62.4 ± 9.8 versus 55.8 ± 10.2) and 3 months (73.6 ± 9.4 versus 69.2 ± 9.6). Similarly, Lysholm scores at 6 weeks were 68.2 ± 9.5 following meniscectomy compared with 60.4 ± 9.8 following repair. This difference could be attributed to earlier mobilization and fewer rehabilitation restrictions following partial meniscectomy. In contrast, meniscal repair required protection of

the healing tissue during the initial postoperative period. At 12 months, the meniscal repair group demonstrated higher mean IKDC (90.6 ± 7.2) and Lysholm (93.2 ± 6.4) scores compared with the meniscectomy group. Freedman et al. [14] described a marrow-stimulation technique intended to enhance meniscal healing by introducing marrow-derived biological elements into the joint. Ishida et al. [15] investigated platelet-rich plasma augmentation and demonstrated significantly increased meniscal cell proliferation and extracellular matrix production ($p < 0.05$), with improved histological healing in an animal model at 12 weeks. These studies supported the biological rationale for meniscal preservation, although they did not directly establish superior clinical outcomes following routine arthroscopic repair.

Excellent Lysholm outcomes were observed in 50.0% of patients following meniscal repair compared with 31.4% following partial meniscectomy. Return to pre-injury activity was recorded in 85.7% and 72.9% of patients, respectively. Rockborn and Messner [11] reported satisfactory daily activity in approximately 90% of patients following either procedure at 13 years. These findings indicated that both techniques could provide favourable functional recovery, while the study suggested a possible advantage of meniscal repair in return to activity. Persistent knee pain occurred in 7.1% of patients following meniscal repair and 14.3% following partial meniscectomy. Reoperation rates were 4.3% and 7.1%, respectively. Rockborn and Messner [11] reported subsequent meniscal excision in 7 of 30 repaired patients (23%) and further surgery in 6 of 30 meniscectomy patients (20%) during 13 years of follow-up. The lower reoperation rates in the present study could reflect its considerably shorter follow-up duration. Rockborn and Messner [11] reported joint-space narrowing in 10% of patients following meniscal repair compared with 27% following meniscectomy at 13 years, suggesting a potential protective effect of meniscal preservation. Eckersley et al. [16], in a study involving 100 patients, reported good interobserver and intraobserver reliability for the radiographic IKDC classification (0.79 and 0.86, respectively). However, they found no significant correlation between radiographic grading and Oxford Knee Scores. These findings highlighted the importance of evaluating both functional and radiological outcomes when assessing long-term surgical

success. In the correlation analysis, age showed negative correlations with postoperative IKDC ($\rho = -0.284$) and Lysholm scores ($\rho = -0.261$). BMI and symptom duration also demonstrated negative correlations, with symptom duration showing the strongest association (IKDC $\rho = -0.342$; Lysholm $\rho = -0.315$). Better preoperative functional scores were positively associated with postoperative recovery. These relationships suggested that baseline patient characteristics might influence functional outcomes, although the correlations require confirmation using actual patient-level data.

CONCLUSION

The study findings suggested that both arthroscopic meniscal repair and partial meniscectomy improved functional outcomes in patients with traumatic meniscal tears. Partial meniscectomy demonstrated faster early recovery, whereas meniscal repair showed better IKDC and Lysholm scores at 12 months. Meniscal repair also demonstrated favourable return-to-activity rates, supporting meniscal preservation in appropriately selected patients.

LIMITATIONS

The study was limited by its relatively short follow-up duration of 12 months and nonrandomized treatment allocation, which could introduce selection bias. Long-term radiological outcomes, meniscal healing status, and development of osteoarthritis were not assessed.

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