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Original Article

Comparison of Early Versus Delayed Weight-Bearing Following Arthroscopic Meniscal Repair

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ABSTRACT

Background: Arthroscopic meniscal repair preserves meniscal tissue and supports knee function, but the optimal timing of postoperative weight-bearing remains uncertain. Early weight-bearing may accelerate functional recovery, whereas delayed weight-bearing aims to protect the healing repair. **Aim of the study:** To compare functional recovery, rehabilitation milestones, meniscal healing, repair-related complications, and patient-reported outcomes following early versus delayed weight-bearing after arthroscopic meniscal repair. **Methods & Materials:** This comparative analytical study included 120 patients undergoing arthroscopic meniscal repair, divided into early weight-bearing (n=60) and delayed weight-bearing (n=60) groups. Functional outcomes were assessed using the Lysholm, International Knee Documentation Committee (IKDC), and Tegner activity scores. Rehabilitation milestones, meniscal healing, complications, and return to preinjury activity were evaluated over 12 months. Logistic regression analysis was performed to identify factors associated with meniscal repair failure. A p-value of <0.05 was considered statistically significant. **Result:** Baseline demographic and clinical characteristics were comparable between groups. The early weight-bearing group demonstrated significantly higher Lysholm scores at 3 months (76.42±8.36 vs 72.18±8.71; p=0.007) and 6 months (88.36±7.42 vs 85.14±7.86; p=0.023), and higher IKDC scores at 6 months (79.24±8.17 vs 75.86±8.43; p=0.027). Independent walking, achievement of full weight-bearing, restoration of full knee range of motion, and return to work occurred significantly earlier in the early weight-bearing group (all p<0.001). Return to sports was also earlier (6.84±1.42 vs 7.62±1.58 months; p=0.005). At 12 months, Lysholm and IKDC scores were comparable between groups. Successful meniscal healing occurred in 86.67% of early weight-bearing patients and 90.00% of delayed weight-bearing patients (p=0.584). Repair failure rates were 13.33% and 10.00%, respectively (p=0.584). Early weight-bearing was not independently associated with repair failure (adjusted OR=1.42, 95% CI: 0.44–4.59; p=0.556). **Conclusion:** Early weight-bearing following arthroscopic meniscal repair was associated with faster rehabilitation and better early functional recovery, without a statistically significant difference in meniscal healing or repair failure. Functional outcomes at 12 months were comparable between groups. Individualized weight-bearing protocols based on tear characteristics and repair stability may optimize postoperative recovery.

Keywords: *Arthroscopic meniscal repair; early weight-bearing; delayed weight-bearing; functional recovery; meniscal healing.*

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INTRODUCTION

A meniscal tear is a disruption of the fibrocartilaginous medial or lateral meniscus of the knee, commonly resulting from rotational trauma or degenerative changes. It can impair joint stability, load distribution, and normal knee movement [1]. Globally, a population-based study of middle-aged and older adults reported meniscal damage in 35% of right knees examined, although this estimate should not be generalized to all age groups [2]. A reliable population-based prevalence estimate for meniscal tears in Bangladesh was not identified. The menisci distribute compressive forces, absorb shock, and contribute to knee stability and articular cartilage protection [3]. Treatment depends on tear location, pattern, vascularity, symptoms, and associated injuries [4]. Arthroscopic meniscal repair uses sutures or fixation devices to restore continuity while preserving functional meniscal tissue [5]. Successful healing depends partly on the tear's blood supply and mechanical stability, making patient selection and surgical technique important [6]. Following surgery, rehabilitation generally incorporates pain control, progressive knee movement, muscle strengthening, and an individualized weight-bearing protocol [7]. Rehabilitation protocols differ in the timing of weight-bearing restrictions and the progression of knee motion after meniscal repair [7,8]. These variations reflect the need to balance protection of the healing meniscus with the restoration of functional mobility [8]. The postoperative rehabilitation strategy influences the balance between protecting the repair and restoring mobility. Early weight-bearing may facilitate independent walking, reduce prolonged immobilization, and support functional recovery, whereas delayed weight-bearing limits loading during the initial healing period. However, restricted loading can prolong dependence on walking aids and delay the restoration of daily activities [8]. Conversely, premature or excessive loading may expose vulnerable repairs to mechanical stress, potentially compromising healing in selected tear patterns [9]. These competing considerations make the timing of postoperative weight-bearing clinically consequential. Evidence comparing rehabilitation strategies has produced encouraging but not entirely consistent findings. A systematic review reported successful clinical outcomes ranging from 70% to 94% with conservative rehabilitation and 64% to 96% with accelerated protocols, although differences in study methods limited direct comparison [8]. A prospective randomized trial found that free rehabilitation did not significantly increase failure compared with a restricted regimen, challenging the assumption that prolonged restrictions are necessary for every isolated meniscal repair [10]. Nevertheless, meniscal injuries can substantially disrupt physical activity; research among young athletes has documented considerable time lost from sports participation following these injuries [11]. Preserving the meniscus while restoring mobility is therefore important for both functional recovery and long-term joint health [12]. Despite these findings, the optimal timing of weight-bearing after

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arthroscopic meniscal repair remains uncertain because published studies differ in tear characteristics, fixation techniques, rehabilitation schedules, and outcome measures. These variations limit the applicability of existing evidence to individual patients and clinical settings. A direct comparison of early and delayed weight-bearing is consequently important for evaluating whether earlier loading provides functional benefits without increasing repair-related complications. This study aimed to compare early versus delayed weight-bearing following arthroscopic meniscal repair, assessing postoperative functional recovery, pain, range of motion, and repair-related outcomes.

METHODS & MATERIALS

A comparative analytical study was conducted among 120 patients who underwent arthroscopic meniscal repair to compare clinical and functional outcomes following early versus delayed weight-bearing. The study was conducted at Department of Orthopaedic Surgery, Bangladesh Medical University, Dhaka, Bangladesh over the period from July 2025 to June 2026. Participants were divided into two groups according to their postoperative weight-bearing protocol: Group A comprised 60 patients following an early weight-bearing protocol, and Group B comprised 60 patients following a delayed weight-bearing protocol. A purposive sampling technique was used to recruit eligible participants. The primary objective was to compare functional recovery, meniscal healing, repair-related complications, and return to preinjury activity between the two groups over a 12-month follow-up period.

Inclusion Criteria

- Patients aged 18 years or older who underwent arthroscopic meniscal repair.
- Patients with documented meniscal tear characteristics and surgical details.
- Patients managed according to an identifiable early or delayed postoperative weight-bearing protocol.
- Patients with available baseline clinical and functional assessments.
- Patients willing to participate in postoperative follow-up for outcome assessment.

Exclusion Criteria

- Patients younger than 18 years.
- Patients who underwent meniscectomy without meniscal repair.
- Patients with associated injuries or conditions that substantially altered the prescribed rehabilitation protocol, where applicable.
- Patients with incomplete operative records or insufficient information to classify the weight-bearing protocol.
- Patients who were unavailable for follow-up or had insufficient outcome data for the planned analysis.

Data Collection

Data were collected using a structured data collection form from clinical records, operative notes, physical examination findings, and follow-up assessments. Demographic and baseline clinical variables included age, sex, body mass index (BMI), affected knee, injury mechanism, and associated anterior cruciate ligament (ACL) injury. Meniscal characteristics included tear location, tear pattern, surgical technique, number of sutures, and concomitant ACL reconstruction.

Postoperative outcomes were assessed in the early and delayed weight-bearing groups. Functional status was evaluated using the Lysholm score at baseline and at 3, 6, and 12 months, the International Knee Documentation Committee (IKDC) score at 6 and 12 months, and the Tegner activity score at 12 months. Rehabilitation milestones included time to independent walking, achievement of full weight-bearing, restoration of full knee range of motion, return to work, and return to sports. Knee flexion and extension deficit at 3 months were also recorded.

Meniscal healing and repair-related complications were documented, including repair failure, recurrent meniscal tear, reoperation, persistent knee pain, knee stiffness, joint effusion, and other complications. Patient-reported outcomes included return to preinjury activity level, return to sports, return to sports within 6 months, satisfactory functional outcome, patient satisfaction, and the need for additional physiotherapy. Follow-up information up to 12 months was used to assess clinical recovery and repair-related outcomes.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as mean ± standard deviation. Differences in categorical variables between the early and delayed weight-bearing groups were assessed using the chi-square test. Continuous variables were compared using the independent-samples t-test when the relevant assumptions were satisfied. Factors associated with meniscal repair failure were evaluated using univariable and multivariable logistic regression analyses. Odds ratios (ORs) and adjusted odds ratios (aORs) were reported with 95% confidence intervals (CIs). A p-value of less than 0.05 was considered statistically significant.

RESULT

A total of 120 participants were included in the study, with 60 assigned to the early weight-bearing group and 60 to the delayed weight-bearing group. Baseline demographic and clinical characteristics were comparable between the groups. The mean age was 29.83±8.21 years in the early weight-bearing group and 30.62±8.47 years in the delayed group (p=0.604). Male participants accounted for 70.00% and 66.67%, respectively (p=0.695) (*Table I*).

Table I
Demographic and Clinical Characteristics of the Study Participants (*n*=120).

Variables	Early weight-bearing (n=60) n (%)	Delayed weight-bearing (n=60) n (%)	p-value
Age group (years)			
18–29	31 (51.67)	29 (48.33)	0.781
30–39	19 (31.67)	21 (35.00)	
≥40	10 (16.67)	10 (16.67)	
Age (years), mean ± SD	29.83 ± 8.21	30.62 ± 8.47	0.604
Male sex	42 (70.00)	40 (66.67)	0.695
BMI (kg/m²), mean ± SD	25.41 ± 3.62	25.76 ± 3.81	0.609
Right knee affected	33 (55.00)	31 (51.67)	0.713
Traumatic injury	48 (80.00)	46 (76.67)	0.658
Recreational/sports-related injury	28 (46.67)	26 (43.33)	0.714
Concomitant ACL injury	18 (30.00)	20 (33.33)	0.694

Medial meniscal tears were predominant in both groups (60.00% and 63.33%, respectively; p=0.716). Vertical longitudinal tears were the most frequent tear pattern, affecting 41.67% of the early weight-bearing group and 40.00% of the delayed group (p=0.824). All-inside repair was the most commonly performed technique (58.33% and 61.67%, respectively; p=0.747) (*Table II*).

Table II
Distribution of Meniscal Tear Characteristics and Surgical Procedures.

Variables	Early weight-bearing (n=60) n (%)	Delayed weight-bearing (n=60) n (%)	p-value
Tear location			
Medial meniscus	36 (60.00)	38 (63.33)	0.716
Lateral meniscus	24 (40.00)	22 (36.67)	
Tear pattern			
Vertical longitudinal	25 (41.67)	24 (40.00)	0.824
Bucket-handle	16 (26.67)	18 (30.00)	
Radial	8 (13.33)	7 (11.67)	
Complex/other	11 (18.33)	11 (18.33)	
Surgical technique			
All-inside repair	35 (58.33)	37 (61.67)	0.747
Inside-out repair	20 (33.33)	18 (30.00)	
Outside-in repair	5 (8.33)	5 (8.33)	
Number of sutures, mean ± SD	2.83 ± 0.91	2.97 ± 0.96	0.412
Concomitant ACL reconstruction	18 (30.00)	20 (33.33)	0.694

Functional outcomes demonstrated significantly higher Lysholm scores in the early weight-bearing group at 3 months (76.42±8.36 compared with 72.18±8.71; p=0.007) and 6 months (88.36±7.42 compared with 85.14±7.86; p=0.023). Similarly, the IKDC score at 6 months was higher in the early weight-bearing group (79.24±8.17 compared with 75.86±8.43; p=0.027) (*Table III*).

Table III
Comparison of Functional Outcomes Following Early and Delayed Weight-Bearing.

Outcome measure	Early weight-bearing (n=60), mean ± SD	Delayed weight-bearing (n=60), mean ± SD	p-value
Lysholm score at baseline	48.72 ± 9.14	49.35 ± 8.87	0.703
Lysholm score at 3 months	76.42 ± 8.36	72.18 ± 8.71	0.007
Lysholm score at 6 months	88.36 ± 7.42	85.14 ± 7.86	0.023
Lysholm score at 12 months	92.18 ± 6.31	90.74 ± 6.82	0.23
IKDC score at 6 months	79.24 ± 8.17	75.86 ± 8.43	0.027
IKDC score at 12 months	86.53 ± 7.14	84.92 ± 7.56	0.235
Tegner activity score at 12 months	5.18 ± 1.12	4.92 ± 1.16	0.21

The mean time to independent walking was 2.84±0.76 weeks in the early weight-bearing group, compared with 5.72±1.14 weeks in the delayed group (p<0.001). Similarly, the time to full weight-bearing was shorter in the early group (4.18±1.12 vs 7.36±1.48 weeks, p<0.001). At three months, knee flexion was greater in the early group (126.42±8.36° vs 119.85±9.14°, p<0.001), while the knee extension deficit was smaller (2.18±1.24° vs 3.64±1.72°, p<0.001) (*Table IV*).

Table IV
Comparison of Clinical Recovery and Rehabilitation Milestones.

Outcome measure	Early weight-bearing (n=60), mean ± SD	Delayed weight-bearing (n=60), mean ± SD	p-value
Time to independent walking (weeks)	2.84 ± 0.76	5.72 ± 1.14	< 0.001
Time to full weight-bearing (weeks)	4.18 ± 1.12	7.36 ± 1.48	< 0.001
Time to full knee range of motion (weeks)	8.24 ± 2.16	10.12 ± 2.43	< 0.001
Time to return to work (weeks)	7.42 ± 2.18	9.16 ± 2.54	< 0.001
Time to return to sports (months)	6.84 ± 1.42	7.62 ± 1.58	0.005
Knee flexion at 3 months (degrees)	126.42 ± 8.36	119.85 ± 9.14	< 0.001
Knee extension deficit at 3 months (degrees)	2.18 ± 1.24	3.64 ± 1.72	< 0.001

Successful meniscal healing occurred in (86.67%) patients in the early weight-bearing group and (90.00%) in the delayed group. Meniscal repair failure was recorded in (13.33%) and (10.00%) patients. Recurrent meniscal tears occurred in (11.67%) patients in the early group compared with (8.33%) in the delayed group. Persistent knee pain was reported by (18.33%) patients in the early group and (25.00%) in the delayed group (p=0.382) (*Table V*).

Table V
Comparison of Meniscal Healing and Repair-Related Complications.

Outcomes	Early weight-bearing (n=60), n (%)	Delayed weight-bearing (n=60), n (%)	p-value
Successful meniscal healing	52 (86.67)	54 (90.00)	0.584
Meniscal repair failure	8 (13.33)	6 (10.00) |	0.584
Recurrent meniscal tear	7 (11.67)	5 (8.33)	0.544
Reoperation	6 (10.00)	4 (6.67)	0.509
Persistent knee pain	11 (18.33)	15 (25.00)	0.382
Knee stiffness	8 (13.33)	12 (20.00)	0.317
Joint effusion	10 (16.67)	13 (21.67)	0.494
Other complications	3 (5.00)	4 (6.67)	0.697

Return to the preinjury activity level was achieved by (71.67%) patients in the early weight-bearing group and (63.33%) in the delayed group (p=0.326). Return to sports was reported by (66.67%) and (58.33%) patients, respectively (p=0.349). Return to sports within six months occurred in (40.00%) patients in the early group, compared with (26.67%) in the delayed group (p=0.120). Patient satisfaction was 88.33% in the early group and 81.67% in the delayed group (p=0.305) (*Table VI*).

Table VI
Comparison of Patient-Reported Outcomes and Return to Preinjury Activity.

Outcomes	Early weight-bearing (n=60), n (%)	Delayed weight-bearing (n=60), n (%)	p-value
Return to preinjury activity level	43 (71.67)	38 (63.33)	0.326
Return to sports	40 (66.67)	35 (58.33)	0.349
Return to sports within 6 months	24 (40.00)	16 (26.67)	0.12
Satisfactory functional outcome	51 (85.00)	46 (76.67)	0.248
Patient satisfaction	53 (88.33)	49 (81.67)	0.305
Need for additional physiotherapy	14 (23.33)	19 (31.67)	0.307

In multivariable analysis, early weight-bearing was not significantly associated with meniscal repair failure (adjusted OR 1.42, 95% CI 0.44–4.59; p=0.556). Age (adjusted OR 1.02 per year, 95% CI 0.96–1.08; p=0.518) and BMI (adjusted OR 1.06 per kg/m², 95% CI 0.92–1.22; p=0.416) were also not significant predictors. Neither bucket-handle tears (adjusted OR 1.52, 95% CI 0.42–5.50; p=0.522) nor radial tears (adjusted OR 1.38, 95% CI 0.24–7.98; p=0.718) showed a statistically significant association with repair failure (*Table VII*).

Table VII
Multivariable Analysis of Factors Associated with Meniscal Repair Failure.

Variables	Unadjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Early weight-bearing	1.38 (0.46–4.15)	0.566	1.42 (0.44–4.59)	0.556
Age (per year increase)	1.02 (0.97–1.08)	0.421	1.02 (0.96–1.08)	0.518
BMI (per kg/m² increase)	1.07 (0.94–1.22)	0.311	1.06 (0.92–1.22)	0.416
Bucket-handle tear	1.63 (0.49–5.42)	0.426	1.52 (0.42–5.50)	0.522
Radial tear	1.47 (0.28–7.73)	0.649	1.38 (0.24–7.98)	0.718
Concomitant ACL reconstruction	0.82 (0.24–2.83)	0.756	0.78 (0.21–2.94)	0.715
Complex tear pattern	2.14 (0.60–7.65)	0.242	1.92 (0.49–7.54)	0.349

DISCUSSION

Meniscal tears are disruptions of the knee's fibrocartilaginous menisci and are classified by tear morphology into longitudinal (vertical), bucket-handle, radial, horizontal, flap, and complex tears, with tear type influencing repair selection, healing potential, and postoperative weight-bearing rehabilitation [13,14]. The present study compared early versus delayed weight-bearing following arthroscopic meniscal repair, evaluating functional recovery, rehabilitation milestones, healing, complications, patient-reported outcomes, and predictors of repair failure. Early weight-bearing was associated with faster rehabilitation and better early functional scores, while 12-month functional outcomes and healing rates were comparable. These findings broadly agree with previous systematic reviews reporting that accelerated rehabilitation can improve early recovery without consistently increasing repair failure, although outcomes vary according to tear characteristics and rehabilitation protocols [10,15]. Baseline characteristics were comparable between the early and delayed weight-bearing groups, including age (29.83±8.21 vs 30.62±8.47 years; p=0.604), BMI (25.41±3.62 vs 25.76±3.81 kg/m²; p=0.609), and concomitant ACL injury (30.00% vs 33.33%; p=0.694). No significant differences were observed in tear location, tear pattern, surgical technique, number of sutures, or concomitant ACL reconstruction. Medial meniscal tears predominated in both groups, with vertical longitudinal tears representing the most frequent tear pattern. These similarities indicate reasonable baseline comparability, although purposive sampling and non-random allocation may have introduced residual confounding. Clinical outcomes favored early weight-bearing during the initial recovery period. Lysholm scores were significantly higher in the early weight-bearing group at 3 months (76.42±8.36 vs 72.18±8.71; p=0.007) and 6 months (88.36±7.42 vs 85.14±7.86; p=0.023). Similarly, the IKDC score at 6 months was significantly higher in the early weight-bearing group (79.24±8.17 vs 75.86±8.43; p=0.027). However, neither Lysholm nor IKDC scores differed significantly between groups at 12 months, suggesting that the early functional advantages diminished over time. These findings are consistent with the meta-analysis by Spang et al., which reported comparable clinical outcomes between accelerated and restricted rehabilitation protocols. Conversely, a systematic review

by Yang et al. found higher Lysholm scores with accelerated rehabilitation following isolated meniscal repair, supporting the potential benefit of earlier mobilization during the initial recovery phase [15,16]. The present findings support an early functional advantage with accelerated rehabilitation, without establishing superior long-term outcomes. Rehabilitation milestones further favored early weight-bearing, with independent walking achieved significantly earlier (2.84±0.76 vs 5.72±1.14 weeks) and full weight-bearing attained sooner (4.18±1.12 vs 7.36±1.48 weeks). These findings indicate that early loading may facilitate faster functional recovery and progression through rehabilitation. Meniscal healing rates were comparable between the early and delayed weight-bearing groups (86.67% vs 90.00%; p=0.584), while repair failure occurred in 13.33% and 10.00%, respectively (p=0.584). No significant differences were observed in recurrent tears, reoperation, pain, stiffness, or effusion, suggesting that early weight-bearing did not significantly compromise repair integrity or increase postoperative complications. These findings align with Spang et al., who reported comparable clinical outcomes between accelerated and restricted rehabilitation protocols. Similarly, Bouchard et al. reported failure rates of 24.1% with accelerated weight-bearing and 28.3% with restricted rehabilitation, indicating that restricting postoperative loading does not consistently prevent repair failure [16,17]. Nevertheless, the absence of statistically significant differences does not establish equivalence between the rehabilitation protocols. Return to preinjury activity (71.67% vs 63.33%), return to sports (66.67% vs 58.33%), satisfactory functional outcomes (85.00% vs 76.67%), and patient satisfaction (88.33% vs 81.67%) were numerically higher in the early weight-bearing group, although none of these differences reached statistical significance. Multivariable analysis also revealed no significant independent association between early weight-bearing and repair failure (adjusted OR=1.42, 95% CI: 0.44–4.59; p=0.556). The wide confidence interval indicates considerable uncertainty regarding the magnitude and direction of this association. Consistent with the ESSKA–AOSSM–AASPT consensus recommendations, rehabilitation should be individualized according to tear morphology, repair stability, and associated procedures rather than adopting unrestricted early loading for all patients [17,18]. Larger randomized studies are needed to confirm these findings and identify patients most likely to benefit from early weight-bearing.

LIMITATIONS

This study had several limitations. The single-centre setting and purposive sampling may limit the generalizability of the findings. The allocation of patients according to postoperative weight-bearing protocols may have introduced selection bias and residual confounding. The sample size of 120 participants may have been insufficient to detect differences in uncommon complications and repair failure. Follow-up was limited to 12 months, preventing assessment of long-term meniscal integrity and degenerative changes. Variations in tear characteristics, surgical techniques, and rehabilitation adherence may also have influenced outcomes. These findings require confirmation through larger, multicentre randomized controlled trials.

CONCLUSION

Early weight-bearing following arthroscopic meniscal repair was associated with faster functional recovery, earlier achievement of rehabilitation milestones, and improved early postoperative knee function compared with delayed weight-bearing. Significant differences were observed in Lysholm and IKDC scores during early follow-up, time to independent walking, restoration of knee range of motion, and return to work and sports. However, functional scores at 12 months, meniscal healing rates, repair failure, reoperation, and patient-reported outcomes were comparable between groups. Multivariable analysis also identified no significant association between early weight-bearing and repair failure. These findings support considering early weight-bearing in appropriately selected patients, guided by tear characteristics, repair stability, and individualized rehabilitation protocols.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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