

FUNCTIONAL OUTCOMES AFTER MULTILIGAMENT KNEE RECONSTRUCTION AT A TERTIARY CARE HOSPITAL

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ABSTRACT

OBJECTIVES

The study aimed to determine short-term functional outcomes after multiligament knee reconstruction and identify factors associated with satisfactory recovery.

METHODOLOGY

This observational study with three-month follow-up included 142 patients aged 20-70 years with magnetic resonance imaging-confirmed injury to at least two major knee ligaments at Khyber Teaching Hospital, Peshawar, from October 2025 to April 2026. Patients underwent surgical repair and/or reconstruction according to injury pattern, followed by departmental rehabilitation. We assessed functional outcome at three months using the Lysholm knee score and categorised it as excellent, good, fair, or poor. We examined associations using chi-square or exact tests, and used binary logistic regression to identify independent predictors of excellent/good outcome.

RESULTS

Mean age was 36.17 ± 12.37 years, and 104 (73.2%) patients were male. Road traffic accidents accounted for 74 (52.1%) injuries. The mean three-month Lysholm score was 81.56 ± 11.89 . Outcomes were excellent in 29 (20.4%), good in 48 (33.8%), fair in 50 (35.2%), and poor in 15 (10.6%) patients; 77 (54.2%) therefore achieved a satisfactory outcome. Functional outcome was associated with age, body mass index, timing of surgery, number of ligaments involved, and meniscal injury. Delayed surgery beyond 14 days, greater ligament involvement, increasing age, and higher body mass index independently reduced the odds of satisfactory recovery.

CONCLUSION

Multiligament knee reconstruction produced satisfactory short-term function in more than half of patients. Earlier management, careful assessment of injury complexity, weight optimisation, and structured rehabilitation may improve recovery, although longer-term multicentre evaluation is required.

KEYWORDS: Multiligament Knee Injury; Knee Reconstruction; Lysholm Score; Functional Outcome; Anterior Cruciate Ligament; Posterior Cruciate Ligament

INTRODUCTION

Multiligament knee injury involves disruption of at least two major stabilising ligaments and represents one of the more complex problems in orthopaedic trauma. Injury may involve the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL), medial collateral ligament (MCL), lateral collateral ligament (LCL), or the posteromedial and posterolateral stabilising structures. These injuries may occur with or without frank knee dislocation and are frequently accompanied by meniscal tears, chondral damage, soft-tissue injury, and neurovascular compromise.^{1,2,3,4} Without adequate stabilisation and rehabilitation, patients may experience persistent instability, pain,

stiffness, impaired mobility, difficulty returning to work or sport, and later post-traumatic osteoarthritis.^{1,2,5} High-energy road traffic trauma, falls, and sporting injuries are common mechanisms. Initial management requires more than confirming ligament disruption: assess vascular status, peroneal-nerve function, associated fractures, soft-tissue condition, and the possibility of occult knee dislocation systematically.^{3,4} MRI is valuable for characterising the ligament pattern and associated intra-articular pathology, while operative planning depends on injury chronicity, tissue quality, patient factors, and the structures requiring repair or reconstruction. Operative management is generally favoured for active patients with clinically important

multiligament instability, although treatment must be individualised. Cruciate ligaments are commonly reconstructed, whereas selected collateral injuries may be repaired or reconstructed depending on tissue quality and timing. Functional recovery depends on more than the technical reconstruction itself. Age, body mass index, injury severity, associated meniscal or cartilage injury, rehabilitation adherence, and the interval between injury and definitive surgery may all affect outcome.^{5,6,7} The optimal timing of reconstruction remains debated. Early stabilisation may restore joint congruity, limit recurrent instability, and facilitate rehabilitation, but surgery performed in an acutely inflamed or poorly mobile knee can increase the risk of stiffness and arthrofibrosis. Systematic reviews have not established one universally superior timing strategy for all injury patterns; soft-tissue recovery, vascular status, range of motion, associated injuries, and rehabilitation readiness should therefore guide decision-making.^{8,9,10} This uncertainty is particularly relevant in settings where delayed referral and limited access to specialised rehabilitation are common. Evidence from Pakistan on functional recovery after multiligament knee reconstruction remains limited. Local trauma patterns, delay in presentation, socioeconomic constraints, and rehabilitation access may differ from those reported in specialised sports-medicine cohorts. The present study therefore evaluated three-month functional outcomes using the Lysholm knee score among patients treated at Khyber Teaching Hospital, Peshawar. It examined whether age, BMI, injury timing, ligament complexity, and associated intra-articular injury were associated with satisfactory recovery.

METHODOLOGY

This descriptive observational study with prospective three-month follow-up was conducted in the Department of Orthopaedics, Khyber Teaching Hospital, Peshawar, from October 2025 to April 2026. The College of Physicians and Surgeons Pakistan Research Evaluation Unit approved the synopsis (CPSP/REU/OSG-2024-020-3111; 5 October 2025). We obtained written informed consent from all participants. The source manuscript does not provide a separate institutional ethics-committee reference; please supply or clarify this before publication. We calculated the sample size using the WHO sample-size calculator, assuming a 10.3% frequency of poor outcome, a 95% confidence level, and a 5% margin of error, resulting in 142 patients. We enrolled consecutive eligible patients aged 20-70 years of either sex. Multiligament knee injury was defined as MRI-confirmed disruption or tear of at least two of the ACL, PCL, MCL, and LCL.

Patients with an infected open wound, established knee contracture, polytrauma, previous fracture of the same knee, or a comorbid condition independently impairing lower-limb function were excluded. A structured proforma recorded age, sex, BMI, residence, education, occupation, socioeconomic status, laterality, time from injury to surgery, mechanism of injury, number and pattern of ligaments involved, and associated meniscal or chondral injury. MRI was used to confirm ligament involvement. All patients underwent operative management under general anaesthesia. We generally reconstructed cruciate ligament injuries and repaired collateral ligament injuries when appropriate; graft preparation, tunnel creation, graft passage, fixation, and final stability assessment followed departmental practice. Consult operative records to confirm exact graft types, fixation devices, and ligament-specific protocols for full procedural reproducibility. Postoperative care included analgesia, wound care, indicated antimicrobial therapy, and physiotherapy according to the departmental rehabilitation protocol. Follow-up assessed wound status, pain, swelling, stiffness, residual instability, and neurovascular status. We measured functional outcome at three months with the 100-point Lysholm knee score and categorised it as excellent (>90), good (84-90), fair (65-83), or poor (<65). We combined the excellent and good categories as a satisfactory outcome for regression analysis. We analysed the data using IBM SPSS Statistics version 26. A p -value ≤ 0.05 was considered statistically significant.

RESULTS

All 142 enrolled patients completed a three-month functional assessment. Mean age was 36.17 ± 12.37 years, 104 (73.2%) were male, and mean BMI was 25.73 ± 4.21 kg/m². Road traffic accident was the leading mechanism of injury (52.1%). Two-ligament injuries were most frequent (62.0%), followed by three-ligament (29.6%) and four-ligament injuries (8.5%). ACL and PCL involvement were documented in 93.0% and 77.5%, respectively. Meniscal injury occurred in 26.1% and chondral injury in 13.4%. The mean three-month Lysholm score was 81.56 ± 11.89 . Outcomes were excellent in 29 (20.4%), good in 48 (33.8%), fair in 50 (35.2%), and poor in 15 (10.6%) patients; consequently, 77 (54.2%) achieved the prespecified satisfactory outcome. Functional category was significantly associated with age ($p < 0.001$), BMI ($p = 0.005$), time from injury to surgery ($p < 0.001$), number of ligaments involved ($p = 0.029$), and associated meniscal injury ($p = 0.026$), but not with sex, laterality, or chondral injury. In the adjusted analysis, surgery after 14 days (AOR 0.010), more ligaments involved (AOR 0.067), older age (AOR 0.656 per year),

and higher BMI (AOR 0.675 per kg/m²) were independent negative predictors of satisfactory outcome. Persistent pain occurred in 12.0%, swelling in 9.9%, stiffness in 9.2%, residual instability in 6.3%, and superficial wound infection in 3.5%; no major neurovascular complication was recorded.

Table 1: Baseline Demographic and Injury-Related Characteristics

Demographic Characteristics	
Variable	Mean ± SD / n (%age)
Age, years	36.17 ± 12.37
20–30 years	55 (38.7)
31–40 years	43 (30.3)
41–50 years	29 (20.4)
>50 years	15 (10.6)
Gender	
Male	104 (73.2)
Female	38 (26.8)
BMI, kg/m ²	25.73 ± 4.21
Normal	62 (43.7)
Overweight	58 (40.8)
Obese	22 (15.5)
Residence	
Urban	84 (59.2)
Rural	58 (40.8)
Education status	
No formal education	26 (18.3)
Primary/Middle	38 (26.8)
Matric/Intermediate	51 (35.9)
Graduate or above	27 (19.0)
Profession	
Student	24 (16.9)
Labourer/Manual worker	42 (29.6)
Driver	18 (12.7)
Office/Private employee	31 (21.8)
Housewife	19 (13.4)
Other	8 (5.6)
Socioeconomic status	
Low	47 (33.1)
Middle	78 (54.9)
High	17 (12.0)
Mechanism, Laterality, Timing, and Injury Complexity	
Variable	Mean ± SD / n (%age)
Mechanism of injury	
Road traffic accident	74 (52.1)
Sports injury	39 (27.5)
Fall from height	21 (14.8)
Other	8 (5.6)
Laterality of joint	
Right knee	79 (55.6)
Left knee	63 (44.4)
Duration of injury, days	20.99 ± 12.71
≤14 days	61 (43.0)
>14 days	81 (57.0)
Number of ligaments involved	
Two ligaments	88 (62.0)
Three ligaments	42 (29.6)
Four ligaments	12 (8.5)

Table 2: Ligament Involvement and Associated Intra-Articular Injuries

Variable	n (%age)
Individual ligament involved	
ACL involved	132 (93.0)
PCL involved	110 (77.5)
MCL involved	71 (50.0)
LCL involved	37 (26.1)
Ligament involvement pattern	
ACL + PCL	100 (70.4)
ACL + MCL	32 (22.5)
PCL + LCL	10 (7.0)
Associated meniscal injury	
Present	37 (26.1)
Absent	105 (73.9)
Associated chondral injury	
Present	19 (13.4)
Absent	123 (86.6)

Table 3: Three-Month Lysholm Outcome and Postoperative Complications

Panel A. Functional outcome		
Variable	Mean ± SD / n (%age)	
Lysholm score at 3 months	81.56 ± 11.89	
Functional outcome		
Excellent	29 (20.4)	
Good	48 (33.8)	
Fair	50 (35.2)	
Poor	15 (10.6)	
Panel B. Postoperative Complications		
Complication	Yes n (%age)	No n (%age)
Persistent pain	17 (12.0)	125 (88.0)
Knee stiffness	13 (9.2)	129 (90.8)
Swelling	14 (9.9)	128 (90.1)
Residual instability	9 (6.3)	133 (93.7)
Superficial wound infection	5 (3.5)	137 (96.5)
Major neurovascular complication	0 (0.0)	142 (100.0)

Table 4: Association of Functional Outcome with Demographic and Clinical Variables

Variable	Excellent n (%)	Good n (%)	Fair n (%)	Poor n (%)	χ ² value	Cramér's V	P-value
Age group					93.879	0.469	<0.001
20–30 years	26 (47.3)	23 (41.8)	6 (10.9)	0 (0.0)			
31–40 years	3 (7.0)	21 (48.8)	18 (41.9)	1 (2.3)			
41–50 years	0 (0.0)	4 (13.8)	18 (62.1)	7 (24.1)			
>50 years	0 (0.0)	0 (0.0)	8 (53.3)	7 (46.7)			
Gender					5.697	—	0.127
Male	17 (16.3)	40 (38.5)	36 (34.6)	11 (10.6)			
Female	12 (31.6)	8 (21.1)	14 (36.8)	4 (10.5)			
BMI category					18.175	0.253	0.005
Normal	19 (30.6)	24 (38.7)	17 (27.4)	2 (3.2)			

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Overweight	10 (17.2)	18 (31.0)	22 (37.9)	8 (13.8)			
Obese	0 (0.0)	6 (27.3)	11 (50.0)	5 (22.7)			
Laterality of joint					1.017	—	0.796
Right knee	16 (20.3)	27 (34.2)	26 (32.9)	10 (12.7)			
Left knee	13 (20.6)	21 (33.3)	24 (38.1)	5 (7.9)			
Duration from injury to surgery					32.667	0.480	<0.001
≤14 days	23 (37.7)	25 (41.0)	12 (19.7)	1 (1.6)			
>14 days	6 (7.4)	23 (28.4)	38 (46.9)	14 (17.3)			
Number of ligaments involved					13.934	0.222	0.029
Variable	Excellent n (%)	Good n (%)	Fair n (%)	Poor n (%)	χ² value	Cramer's V	p-value
Two ligaments	24 (27.3)	32 (36.4)	27 (30.7)	5 (5.7)			
Three ligaments	5 (11.9)	13 (31.0)	17 (40.5)	7 (16.7)			
Four ligaments	0 (0.0)	3 (25.0)	6 (50.0)	3 (25.0)			
Associated meniscal injury					9.258	0.255	0.026
Present	2 (5.4)	12 (32.4)	19 (51.4)	4 (10.8)			
Absent	27 (25.7)	36 (34.3)	31 (29.5)	11 (10.5)			
Associated chondral injury					4.564	—	0.203
Present	2 (10.5)	4 (21.1)	10 (52.6)	3 (15.8)			
Absent	27 (22.0)	44 (35.8)	40 (32.5)	12 (9.8)			

Table 5: Binary Logistic Regression for Predictors of Satisfactory Functional Outcome

Variable	B	Wald	Adjusted OR	95% CI for OR	p-value
Duration from injury to surgery >14 days	-4.604	15.256	0.010	0.001–0.101	<0.001
Number of ligaments involved	-2.698	13.335	0.067	0.016–0.287	<0.001
Associated meniscal injury	0.822	0.848	2.274	0.396–13.072	0.357
Age, years	-0.421	22.285	0.656	0.551–0.782	<0.001
BMI, kg/m ²	-0.393	14.046	0.675	0.549–0.829	<0.001

DISCUSSION

Multiligamentous knee injuries are among the most challenging injuries managed in orthopaedic practice because they involve disruption of two or more major stabilising ligaments of the knee and may be associated

with meniscal, chondral, neurovascular, and soft-tissue damage. In the present study, multiligamentous knee reconstruction resulted in a mean Lysholm score of 81.56 ± 11.89 at three months. Overall, 54.2% of patients achieved excellent or good functional outcome, while 45.8% had fair or poor outcome. These findings suggest that surgical reconstruction can provide acceptable short-term functional recovery in a considerable proportion of patients, although postoperative function remains variable. Boos et al. reported that patients undergoing surgical reconstruction of multiligamentous knee injuries showed subjective improvement and high satisfaction at long-term follow-up, although functional scores varied and were influenced by patient and injury characteristics.¹⁴ Similarly, Lang et al. reported encouraging functional recovery after operative treatment of multiligament knee injuries in an adolescent population, supporting the role of surgical stabilisation in restoring knee function.¹⁵ However, age was significantly associated with better functional outcome in the present study. The best results were seen in those aged 20–30 years, with fair and poor results at older ages. Multivariate regression analysis also showed that age was an independent predictor of an unfavourable functional outcome. This aligns with Boos et al., who assessed long-term outcomes after surgical reconstruction and emphasised that patient-related factors such as age are important in recovery following a multiligamentous knee injury.¹⁴ Zhang et al. also noted that the long-term consequences of multiligament knee injuries can be restricted in certain individuals, especially if degenerative changes occur, or if symptoms or functional deficits persist over time.¹⁶ The cause of this poorer outcome in older patients in the present study is not completely understood. However, it may be due to reduced healing capacity, delayed response to rehabilitation, lower recovery of muscle strength, and more severe pre-existing degenerative joint changes. Road traffic accident was the most common mechanism of injury in this study, followed by sports injury and fall from height. This is the trend seen in many multiligament knee injuries in tertiary-care trauma settings, which are high-energy injuries. Fortier et al. stated that multiligament injuries of the knee were complex injuries that are often associated with high-energy trauma, knee dislocation, neurovascular compromise, and associated intra-articular disease.³ Similarly, Scheepers et al. emphasised that careful assessment of vascular status, nerve function, ligament pattern, and associated injuries is essential before planning definitive treatment.⁴ The male predominance observed in this study is clinically plausible, as males are more likely to be involved in road traffic accidents, outdoor work, manual labour, and sporting activities. In the present study, timing of

surgery was one of the most important factors correlated with outcome. Patients undergoing surgery within 14 days had significantly improved functional recovery; surgery performed after 14 days was an independent risk factor for significantly decreased odds of excellent or good outcomes. This finding aligns with the idea that early stabilisation could help minimise chronic instability, rehabilitation needs, and secondary meniscal or chondral damage. However, when to operate on a multiligament knee remains debated. In a systematic review, Marder et al. found insufficient evidence to determine which surgery (acute or delayed) produced better clinical and functional outcomes in all patients.⁸ Herman et al. further reported limited consensus on when to perform surgery and rehabilitation, and these decisions should be tailored to the patient's soft-tissue status, injury severity, vascularity, and rehab status.⁹ Vaishya et al. also noted that early surgery can improve function and stability but may also affect stiffness risk, depending on patient selection and rehabilitation protocols.⁸ Hence, the results of the present study corroborate those of previous studies. Another important factor was BMI, which had a negative impact on postoperative recovery. The patients with normal BMI had better functional outcomes, while the patients who were overweight and obese had a higher percentage of fair and poor outcomes. In addition, regression analyses showed that higher BMI independently predicted poor recovery outcomes. This may be because higher BMI increases mechanical strain on the rebuilt knee, makes rehabilitation more challenging, slows quadriceps recovery, or increases the likelihood of pain or stiffness afterwards. In a systematic review and meta-analysis, Klasan et al. found that at 2 years, patients with multiligament knee injuries can attain a knee function of around 80-85%.¹⁷ The results suggest that injury-related and patient-related factors affect recovery after surgery. BMI is one modifiable factor, and it is suggested that this should be addressed during pre- and postoperative counselling and rehabilitation planning. The number of ligaments involved was significantly associated with functional outcome in the current study. Patients with two-ligament injuries had better functional outcomes than those with three- and four-ligament injuries. This makes clinical sense, as more ligament involvement indicates a more severe injury, more complex reconstruction, greater instability, and greater rehabilitation needs. Similarly, Pizza et al. reported good long-term results in surgically treated posterior cruciate ligament-based multiligament knee injuries and indicated that certain injury patterns and corner involvement may be associated with increased failure risk.¹⁸ A systematic review and meta-analysis by Jaibaji et al. found that staged reconstruction might

offer superior functional results and reduced arthrofibrosis and complication rates in a subset of multiligament knee injuries. These results are consistent with the current recommendation for a more complex approach to counselling patients about recovery.¹⁹ In univariate analysis, associated meniscal injury was associated with functional outcome, but was not independent in logistic regression analysis after adjusting for other variables. Thirteen point four per cent of patients had associated chondral injury, which did not reach statistical significance in the final association analysis. In a systematic review and meta-analysis, Kim et al. found that approximately 27-30% of multiligament knee injuries have associated meniscal and/or cartilage injuries.¹¹ Figueroa et al. also emphasised that meniscal lesions are frequent in multiligament knee injuries and should be carefully identified and treated because they may affect long-term joint preservation.²⁰ The lower incidence of chondral injuries in the present study could be attributed to injury mechanism, diagnostic sensitivity, documentation, or the relatively short follow-up period. Postoperative complication rates were comparable in this study. No major neurovascular complication was reported, but 12.0% of patients reported pain that persisted, 9.9% reported swelling, 9.2% reported knee stiffness, 6.3% reported continued instability, and 3.5% reported a superficial wound infection. Studies by Patel et al. have shown that patient-related factors, smoking, surgical timing and staged procedures may affect the likelihood of complications following operative treatment of multiligament knee injuries.¹² Rodríguez-Merchán also noted that stiffness, residual instability, infection, thromboembolic events, and neurovascular complications still are significant problems after surgical reconstruction of multiligament knee injuries.¹³ Compared with these reports, the complication frequency in the present study appears acceptable, possibly because we excluded polytrauma patients, patients with infected wounds, and patients with established contractures. These results are most useful for preoperative counselling and service planning. Surgery alone did not determine functional recovery; age, body mass index, injury complexity, and timing were all related to outcome. Early referral to a centre capable of vascular assessment, ligament reconstruction, and structured rehabilitation may reduce avoidable delay. At the same time, the association between surgery within 14 days and better outcome should not be interpreted as proof that every multiligament injury requires immediate reconstruction, because soft-tissue condition, vascular injury, associated fractures, stiffness risk, and rehabilitation readiness must influence timing. The findings support individualised decision-making rather than an inflexible time threshold.

LIMITATIONS

This single-centre observational study used non probability consecutive sampling and a short three-month outcome window. Consequently, the study cannot determine long-term graft survival, return to work or sport, revision surgery, post-traumatic osteoarthritis, or sustained patient satisfaction. The Lysholm score was the principal functional measure; the authors did not include IKDC, KOOS, Tegner activity level, objective laxity measurements, or generic quality-of-life measures. Surgical technique, graft type, fixation method, rehabilitation adherence, and ligament-specific reconstruction strategy were not fully characterised in the submitted manuscript and may confound outcome. Several regression effect estimates were large, and model performance may be optimistic in a single sample. Multicentre prospective studies with standardised surgical and rehabilitation protocols and longer follow-up are required.

CONCLUSIONS

At three months, multiligament knee reconstruction produced excellent or good Lysholm outcomes in 54.2% of patients. Younger age, lower BMI, earlier surgery, and less complex ligament injury were associated with better recovery. The findings support timely specialist assessment, individualised surgical planning, optimisation of modifiable patient factors, and structured rehabilitation, while longer follow-up is necessary to determine durability and late complications.

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REFERENCES

- Djebara AE, Pujol N. Long-term functional outcomes of multiligament knee reconstructions with lateral injuries. *Orthop Traumatol Surg Res.* 2022;108(3):103240. doi:10.1016/j.otsr.2022.103240. PMID: 35150926.
- Mortazavi SMJ, Kaseb MH, Maleki RG, Razzaghof M, Noori A, Rezaee R. The functional outcomes of delayed surgical reconstruction in nonsport-induced multiligament knee injuries: a retrospective cohort study. *J Knee Surg.* 2022;35(10):1097-1105. doi:10.1055/s-0040-1721788. PMID: 33389731.
- Fortier LM, Stylli JA, Civilette M, Duran NS, Hanukaai S, Wilder H, et al. An evidence-based approach to multiligamentous knee injuries. *Orthop Rev (Pavia).* 2022;14(4):35825. doi:10.52965/001c.35825. PMID: 35769647.
- Scheepers W, Khanduja V, Held M. Current concepts in the assessment and management of multiligament injuries of the knee. *SICOT J.* 2021;7:62. doi:10.1051/sicotj/2021058. PMID: 34870591.
- Hughes AJ, Li ZI, Garra S, Green JS, Chalem I, Triana J, et al. Clinical and functional outcomes of documented knee dislocation versus multiligamentous knee injury: a comparison of KD3 injuries at mean 6.5 years follow-up. *Am J Sports Med.* 2024;52(4):961-967. doi:10.1177/03635465241231032. PMID: 38400667.
- Mojica ES, Bi AS, Vasavada K, Moran J, Buzin S, Kahan J, et al. Poorer functional outcomes in patients with multiligamentous knee injury with concomitant patellar tendon ruptures at 5 years follow-up. *Knee Surg Sports Traumatol Arthrosc.* 2023;31(1):325-331. doi:10.1007/s00167-022-07110-3. PMID: 36048200.
- Schneebeil V, Philippe V, Applegate LA, Martin R. Prognostic factors for multiligament knee injury treated with multiligament reconstruction: functional and radiological outcomes at 2 to 8 years postoperatively. *Orthop J Sports Med.* 2024;12(8):23259671241261103. doi:10.1177/23259671241261103. PMID: 39143988.
- Marder RS, Poonawala H, Pincay JJ, Nguyen F, Cleary PF, Persaud CS, et al. Acute versus delayed surgical intervention in multiligament knee injuries: a systematic review. *Orthop J Sports Med.* 2021;9(10):23259671211027855. doi:10.1177/23259671211027855. PMID: 34671686.
- Herman ZJ, Kaarre J, Wackerle AM, Lott A, Apseloff NA, Lesniak BP, et al. Timing of surgery and rehabilitation after multiligamentous knee reconstruction. *Curr Rev Musculoskelet Med.* 2024;17(11):476-483. doi:10.1007/s12178-024-09923-w. PMID: 39174807.
- Vaishya R, Patralekh MK, Vaish A, Tollefson LV, LaPrade RF. Effect of timing of surgery on the outcomes and complications in multi-ligament knee injuries: an overview of systematic reviews and a meta-analysis. *Indian J Orthop.* 2024;58(9):1175-1187. doi:10.1007/s43465-024-01224-1. PMID: 39170656.
- Kim SH, Park YB, Kim BS, Lee DH, Pujol N. Incidence of associated lesions of multiligament knee injuries: a systematic review and meta-analysis. *Orthop J Sports Med.* 2021;9(6):23259671211010409. doi:10.1177/23259671211010409. PMID: 34368374.
- Patel NK, Lian J, Nickoli M, Vaswani R, Irrgang JJ, Lesniak BP, et al. Risk factors associated with complications after operative treatment of multiligament knee injury. *Orthop J Sports Med.* 2021;9(3):2325967121994203. doi:10.1177/2325967121994203. PMID: 33855095.
- Rodríguez-Merchán EC, De la Corte-Rodríguez H, Encinas-Ullán CA, Gómez-Cardero P. Complications of surgical reconstruction of multiligament injuries of the knee joint: diagnosis, prevention and treatment. *EFORT Open Rev.* 2021;6(10):973-981. doi:10.1302/2058-5241.6.210057. PMID: 34760296.
- Boos AM, Wang AS, Hevesi M, Krych AJ, Stuart MJ, Levy BA. Long-term outcomes after surgical reconstruction of multiligamentous knee injuries: results at minimum 10-year follow-up. *Orthop J Sports Med.* 2024;12(1):23259671231223188. doi:10.1177/23259671231223188. PMID: 38222026.
- Lang PJ, Feroe A, Franco H, Hussain ZB, Tepolt FA, Kocher MS. Outcomes of operative management of multi-ligament knee injuries in an adolescent population: a retrospective case series. *J Pediatr Soc North Am.* 2023;5(4):742. doi:10.55275/JPOSNA-2023-742. PMID: 40432936.
- Zhang T, Shasti K, Dubina A, Schneider MB, Aneizi A, Packer JD, et al. Long-term outcomes of multiligament knee injuries. *J Orthop Trauma.* 2022;36(8):394-399. doi:10.1097/BOT.0000000000002348. PMID: 35149619.

17. Klasan A, Maerz A, Putnis SE, Ernat JJ, Ollier E, Neri T. Outcomes after multiligament knee injury worsen over time: a systematic review and meta-analysis. *Knee Surg Sports Traumatol Arthrosc.* 2025;33(4):1281-1298. doi:10.1002/ksa.12442. PMID: 39194423.
18. Pizza N, Di Paolo S, Grassi A, Pagano A, Viotto M, Dal Fabbro G, et al. Good long-term patients reported outcomes, return-to-work and return-to-sport rate and survivorship after posterior cruciate ligament (PCL)-based multiligament knee injuries (MLKI) with posteromedial corner tears as significant risk factor for failure. *Knee Surg Sports Traumatol Arthrosc.* 2023;31(11):5018-5024. doi:10.1007/s00167-023-07547-0. PMID: 37668614.
19. Jaibaji M, Najim O, Alali H, Wood L, Van Niekerk L, Bonner T, et al. Single-stage vs. multi-stage reconstruction in multi-ligament knee injuries: a systematic review and meta-analysis of outcomes and complications. *J Clin Med.* 2025;14(19):6897. doi:10.3390/jcm14196897. PMID: 41095975.
20. Figueroa D, Figueroa ML, Cañas M, Feuereisen A, Figueroa F. Meniscal lesions in multi-ligament knee injuries. *Indian J Orthop.* 2024;58(9):1224-1231. doi:10.1007/s43465-024-01217-0. PMID: 39170649.

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The authors accept responsibility for all aspects of the work and will ensure that any concerns regarding the accuracy or integrity of any part are properly investigated and resolved.



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