Evidence-Based Medicine Series Systematic Review

Decision Making in the Multiligament-Injured Knee: An Evidence-Based Systematic Review

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Purpose: The purpose of this systematic review was to address the treatment of multiligament knee injuries, specifically (*1*) surgical versus nonoperative treatment, (*2*) repair versus reconstruction of injured ligamentous structures, and (*3*) early versus late surgery of damaged ligaments. **Methods:** Two independent reviewers performed a search on PubMed from 1966 to August 2007 using the terms "knee dislocation," "multiple ligament–injured knee," and "multiligament knee reconstruction." Study inclusion criteria were (*1*) levels I to IV evidence, (*2*) "multiligament" defined as disruption of at least 2 of the 4 major knee ligaments, (*3*) measures of functional and clinical outcome, and (*4*) minimum of 12 months' follow-up, with a mean of at least 24 months. **Results:** Four studies compared surgical treatment with nonoperative treatment. There was a higher percentage of excellent/good International Knee Documentation Committee (IKDC) scores (58% *v* 20%) in surgically treated patients, as well as higher rates for return to work (72% *v* 52%) and return to full sport (29% *v* 10%). Two studies compared repair with reconstruction of damaged structures, with similar mean Lysholm scores (88 *v* 87) and excellent/good IKDC scores (51% *v* 48%). However, repair of the posterolateral corner had a higher failure rate (37% *v* 9%). Similarly, repair of the cruciates yielded decreased stability and range of motion and a lower return to preinjury activity levels (0% *v* 33%). There were 5 studies comparing early surgery (≤3 weeks) with late surgery. Early treatment resulted in higher mean Lysholm scores (90 *v* 82) and a higher percentage of excellent/good IKDC scores (47% *v* 31%), as well as higher sports activity scores (89 *v* 69) on the Knee Outcome Survey. **Conclusions:** Our review suggests that early operative treatment of the multiligament-injured knee yields improved functional and clinical outcomes compared with nonoperative management or delayed surgery. Repair of the posterolateral corner may yield higher revision rates compared with reconstruction. **Key Words:** Systematic review—Multiligament knee injury—Posterolateral corner—Nonoperative—Early surgery.

The multiligament-injured knee is a complex problem in orthopaedic surgery, typically arising from an acute knee dislocation.[1-5] The high degree of energy required for dislocation usually leads to disruption of at least 3 of the 4 major ligaments, often with concomitant fracture and vascular and nerve damage about the joint.[1-4,6-11] The potential morbidity of this condition is significant, with instability and pain being

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reported many years after the initial injury.[5,8,11-13] Definitive treatment can vary from limb immobilization to acute or chronic repair/reconstruction of damaged ligamentous structures.[1,11,12,14-24] Knee dislocations account for less than 0.02% of all orthopaedic injuries,[1,8,11,20] which creates a challenge in conducting large, prospective clinical trials for multiligament knee injuries. There is thus a paucity of high-level evidence on which to base treatment decisions, and controversy regarding optimal management for these uncommon but debilitating conditions is ongoing.

The purpose of this systematic review was to address the treatment of multiligament knee injuries, specifically 3 aspects of treatment: (*1*) utility of surgical treatment versus nonoperative treatment, (*2*) repair versus reconstruction of injured ligamentous structures, and (*3*) early versus late surgical treatment of damaged ligaments.

METHODS

We identified all published studies in the English language addressing treatment of multiligament-injured knees. Two independent reviewers performed a search of the Medline database on PubMed from 1966 to August 2007, using the terms "knee dislocation," "multiple ligament–injured knee," and "multiligament knee reconstruction." Studies were included in our systematic review if they met the following guidelines: (*1*) they provided levels I to IV evidence addressing the 3 areas of interest outlined previously, (*2*) they defined "multiligament" as the disruption of at least 2 of the 4 major knee ligament structures (anterior cruciate ligament [ACL], posterior cruciate ligament [PCL], posteromedial corner, and posterolateral corner [PLC]), (*3*) they included measures of functional and clinical outcome, and (*4*) they had a minimum of 12 months' follow-up, with a mean of at least 24 months. Series that included large proportions of patients with fracture dislocations of the knee (i.e., tibial plateau fractures and/or distal femur fractures requiring open reduction–internal fixation) were also excluded in favor of primarily ligamentous injuries. Citations from relevant studies, as well as from any review articles captured by the search, were also examined to determine whether they were suitable for inclusion. Studies not meeting these guidelines were excluded.

TABLE 1. *Description of Studies Comparing Surgical Treatment With Nonoperative Treatment in Multiligament Knee Injuries*

Study	Year	Design	Level of Evidence
Wong et al.[25]	2004	Retrospective cohort	IV
Rios et al.[16]	2003	Retrospective cohort	IV
Richter et al.[26]	2002	Retrospective cohort	III
Dedmond and Almekinders[23]	2001	Meta-analysis	IV

TABLE 2. *Description of Studies Comparing Repair With Reconstruction of Damaged Structures in Multiligament Knee Injuries*

Study	Year	Design	Level of Evidence
Stannard et al.[27]	2005	Prospective cohort	II
Mariani et al.[28]	1999	Retrospective cohort	III

RESULTS

The PubMed search identified 413 articles. There were 4 studies that compared surgical treatment with nonoperative treatment in multiligament knee injuries[16,23,25,26] (Table 1). There were 2 studies that compared repair with reconstruction of damaged structures in multiligament-injured knees[27,28] (Table 2). There were 5 studies comparing early and late surgical treatment in multiligament knee injuries[14,29-32] (Table 3).

Operative Versus Nonoperative Management

Of the 4 studies that compared operative versus nonoperative treatment as a primary focus of investigation,[16,23,25,26] one study was a meta-analysis of investigations published before 2000.[23] The inclusion criteria for the meta-analysis were similar to those of our study. The combined sample from all 4 investigations was 227 operatively treated patients and 107 nonoperatively treated patients. The mean age was 32 years in both treatment arms, and it ranged from 11 to

TABLE 3. *Description of Studies Comparing Early With Late Surgical Treatment in Multiligament Knee Injuries*

Study	Year	Design	Level of Evidence
Tzurbakis et al.[32]	2006	Retrospective cohort	IV
Harner et al.[31]	2004	Retrospective cohort	IV
Liow et al.[30]	2003	Retrospective cohort	IV
Wascher et al.[14]	1999	Retrospective cohort	IV
Fanelli et al.[29]	1996	Retrospective cohort	IV

TABLE 4. *Summary of Demographics and Functional Results in Studies Comparing Surgical Treatment With Nonoperative Treatment in Multiligament Knee Injuries*

Study	No. of Patients		Mean Age (yr)		Mean F/U (mo)		Mean Lysholm Score		IKDC (% Excellent/ Good)		Tegner Score	
	Surg	Con	Surg	Con	Surg	Con	Surg	Con	Surg	Con	Surg	Con
Wong et al.[25]	15	11	22	22	34	34	NR	NR	73	54	NR	NR
Rios et al.[16]	21	5	33	36	36	36	77	40	76	0	NR	NR
Richter et al.[26]	59	18	34	34	98	98	78	65	24	6	4	3
Dedmond and Almekinders[23]	132	73	37	37	36	36	85	67	NR	NR	NR	NR
Total	227	107	32	32	51	51	80	57	58	20	4	3

Abbreviations: F/U, follow-up; Surg, surgical treatment; Con, conservative treatment; NR, not reported.

76 years overall, with all studies exhibiting wide age ranges.

Three studies used the Lysholm score to record postoperative outcome.[16,23,26] Surgical treatment resulted in consistently higher mean Lysholm scores, with statistical significance being achieved in 1 investigation.[26] Surgical treatment also resulted in a higher postoperative Tegner score (4 *v* 3) in the study by Richter et al.[26] Three studies used the International Knee Documentation Committee (IKDC) score.[16,25,26] There was a higher percentage of excellent/good IKDC scores (58% *v* 20%) in the surgically treated patients versus those treated nonoperatively at a mean follow-up of 51 months (Table 4). Statistical significance for IKDC scores was attained by 2 of the studies.[25,26] In those studies that reported return-to-work data, patients who underwent surgery returned to work (72% *v* 52%) at a higher rate than the nonoperative cohort[16,25] (Table 5). Similarly, for those investigations reporting return to sports activities, surgical treatment was superior (29% *v* 10%) in restoring preinjury activity.[23,25,26] Clinically, mean range of motion (ROM) (126° *v* 123°) and flexion loss (4° *v* 3°) were similar between groups of patients from 2 studies.[23,26]

Repair Versus Reconstruction

Two studies focused on surgical repair versus reconstruction of ligamentous injury.[27,28] The combined cohort included 52 repaired and 28 reconstructed patients. Mean ages were similar for both included investigations (Table 6).

Mariani et al.[28] compared patients with combined ACL/PCL injuries who had either direct ACL/PCL repair (group 1), ACL reconstruction/PCL repair (group 2), or ACL/PCL reconstruction (group 3). All 3 groups had similar final mean Lysholm scores (84 *v* 86 *v* 85) and percentage of excellent/good final IKDC scores (18% *v* 33% *v* 25%) (P = not significant) (Table 6). However, direct repair of the cruciates resulted in a higher rate of flexion loss greater than 6° (82% *v* 67% *v* 33%, P = not significant), higher rate of posterior sag sign (100% *v* 100% *v* 33%, $P = .003$), and lower rate of return to preinjury activity level (0% *v* 0% *v* 33%, $P = .006$). Stannard et al.[27] compared

TABLE 5. *Summary of Functional and Clinical Results in Studies Comparing Surgical Treatment With Nonoperative Treatment in Multiligament Knee Injuries*

Study	Return to Work		Return to Sport		Mean ROM		Mean Flexion Loss	
	Surg	Con	Surg	Con	Surg	Con	Surg	Con
Wong et al.[25]	NR	NR	0%	0%	129°	137°	6°	2°
Rios et al.[16]	NR	NR	NR	NR	NR	NR	NR	NR
Richter et al.[26]	85%	53%	56%	17%	NR	NR	NR	NR
Dedmond and Almekinders[23]	58%	50%	31%	14%	123°	108°	1°	4°
Total	72%	52%	29%	10%	126°	123°	4°	3°

Abbreviations: Surg, surgical treatment; Con, conservative treatment; NR, not reported.

TABLE 6. *Summary of Demographics and Functional Results in Studies Comparing Repair With Reconstruction of Damaged Structures in Multiligament Knee Injuries*

	No. of Patients		Mean Age (yr)		Mean F/U (mo)		Mean Lysholm Score		IKDC (% Excellent/Good)		Failures	
Study	Repair	Recon	Repair	Recon	Repair	Recon	Repair	Recon	Repair	Recon	Repair	Recon
Stannard et al.[27]	35	22	31	36	33	33	88	91	71	77	37%	9%
Mariani et al.[28]*	17	6	25	35	83	83	85	85	24	25	NR	NR
Total	52	28	28	36	58	58	87	88	48	51	37%	9%

Abbreviations: F/U, follow-up; Recon, reconstruction; NR, not reported.
*Repair groups 1 and 2 were combined for greater clarity.

repair with reconstruction of the PLC. The final mean Lysholm and IKDC scores were not statistically different between groups (Table 6). However, repair of the PLC had a higher rate of failure (37% *v* 9%) at 58 months of follow-up. There was no statistical difference in flexion loss, although this was reported in a format not amenable to inclusion in our data table. Patients in both studies who underwent reconstruction of damaged ligamentous structures returned to previous sporting activities at a higher rate overall (51% *v* 23%) than those undergoing repair, whereas both groups were similarly able to return to work (73% *v* 77%)[27,28] (Table 7).

Early Versus Delayed Surgery

There were 5 studies that compared early versus delayed surgery.[14,29-32] The definition of early surgery was inconsistent across the groups but did not exceed 3 weeks in any of the investigations. Delayed surgery was considered surgery performed at any time beyond 3 weeks and averaged 51 weeks after injury (range, 22 to 123 weeks). The combined sample included 80 patients who underwent early surgery versus 50 patients in the late group. Again, the mean ages were similar for both groups, with large age ranges observed.

The early surgical treatment of multiligament knee injuries resulted in higher mean Lysholm scores (90 *v* 82), as well as a higher percentage of excellent/good IKDC scores (47% *v* 31%), compared with delayed treatment (Table 8). However, 2 studies showed no statistical difference between groups for Lysholm score,[29,31] whereas 1 did show a statistical difference.[32] Tegner scores were similar (5 *v* 5) at approximately 40 months' follow-up, as was mean age (28 years *v* 29 years). Patients receiving early treatment showed statistically higher sports activity scores (89 *v* 69) on the Knee Outcome Survey, as compared with the chronically treated cohort, but no statistical difference in activities–of–daily living scores (91 *v* 84)[31] (Table 9). Clinically, there was no statistical difference for mean ROM[31,32] (130° *v* 129°) and flexion loss[31] (7° *v* 7°) between groups. Patients treated acutely underwent surgery at a mean of 2 weeks after injury, whereas patients with chronic multiligamentous deficits underwent surgery at a mean of 51 months after injury.

Several limitations were present in the studies chosen for this systematic review. A selection bias resulting from the variable acuity of patients sustaining multiligament knee injuries decreased external validity. For example, patients were not randomized for either repair or reconstruction in the study by Stannard et al.[27] but, rather, were selected for the repair arm only if tissues were favorable. It is possible that this

TABLE 7. *Summary of Functional and Clinical Results in Studies Comparing Repair With Reconstruction of Damaged Structures in Multiligament Knee Injuries*

	Return to Work		Return to Sport		Mean ROM		Flexion Loss	
Study	Repair	Recon	Repair	Recon	Repair	Recon	Repair	Recon
Stannard et al.[27]	77%	73%	46%	68%	128°	128°	NR	NR
Mariani et al.[28]*	NR	NR	0%	33%	NR	NR	75%	33%
Total	77%	73%	23%	51%	128°	128°	NR	NR

Abbreviations: Recon, reconstruction; NR, not reported.
*Repair groups 1 and 2 were combined for greater clarity.

TABLE 8. *Summary of Demographics and Functional Results in Studies Comparing Early With Late Surgical Treatment in Multiligament Knee Injuries*

	No. of Patients		Mean Age (yr)		Mean F/U (mo)		Mean Interval From Injury to Surgery (wk)		Mean Lysholm Score		Tegner Score		IKDC (% Excellent/ Good)	
Study	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late	Early	Late
Tzurbakis et al.[32]	35	9	29	29	51	51	1	29	88	82	4	NR	77	56
Harner et al.[31]	19	12	29	29	44	45	2	28	91	80	NR	NR	53	8
Liow et al.[30]	7	14	26	27	25	38	1	123	87	75	5	4	43	36
Wascher et al.[14]	9	4	26	31	38	40	3	22	92	79	NR	NR	44	50
Fanelli et al.[29]	10	11	NR	NR	39	39	3	99	90	92	5	5	NR	NR
Total	80	50	28	29	40	43	2	51	90	82	5	5	47	31

Abbreviations: F/U, follow-up; NR, not reported.

may have led to an overestimation of functional results in this group. Both Rios et al.[16] and Liow et al.[30] analyzed patients with open dislocations and severe systemic trauma, alongside patients with less severe injuries. Patients with more serious conditions were preferentially placed into the nonoperative or chronic treatment arms (depending on the study), potentially skewing the results in favor of (acute) operative management. To control for this, we recommend that a standardized measure of acuity, such as the Injury Severity Scale, be used for patient allocation in future studies.

The application of objective functional and clinical outcome measures was not uniform. No one measure was used in every study included in this group. Furthermore, some authors used qualitative expressions of outcome,[14,16,26,28,32,33] whereas others reported numeric values.[25,27] This made head-to-head comparison difficult, and in some cases we had to extrapolate for analysis.[25]

Changes in surgical technique within the time line of individual studies also diminished validity. Patients in the study by Wong et al.[25] received either repair or reconstruction of torn ligaments, based on the date of study inclusion. In other words, the repair group acted as a historical control. Although the authors compared these 2 groups, a statistical comparison between each surgical group and the nonoperative cohort was not carried out. Nonoperative treatment may have been superior, for example, to repair of damaged structures.

All studies suffered from a small sample size, which may be unavoidable because of the rarity of multiligament knee injuries. The reporting of statistical significance was consequently variable, decreasing the validity of our conclusions. The age range varied widely for all studies and was not controlled for, but

TABLE 9. *Summary of Functional and Clinical Results in Studies Comparing Early With Late Surgical Treatment in Multiligament Knee Injuries*

	Knee Outcome Survey							
	Activities of Daily Living		Sports Activity		Mean ROM		Mean Flexion Loss	
Study	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic
Tzurbakis et al.[32]	NR	NR	NR	NR	130°	132°	8°	6°
Harner et al.[31]	91	84	89	69	128°	129°	13°	10°
Liow et al.[30]	NR	NR	NR	NR	NR	NR°	4°	8°
Wascher et al.[14]	NR	NR	NR	NR	132°	126°	5°	3°
Fanelli et al.[29]	NR	NR	NR	NR	NR	NR	NR	NR
Total	91	84	89	69	130°	129°	7°	7°

Abbreviation: NR, not reported.

healing potential may differ between age groups, necessitating more individualized management.

Given the complexity of surgically repairing/reconstructing the multiligament-injured knee, it is important to recognize that a surgical learning curve was likely present in all of the studies included. Results may have improved over time. Advances in surgical equipment and fixation devices likely had an impact as well. It was not possible to analyze the effect of such advances as well as that of the surgical learning curve in this investigation.

DISCUSSION

The management of the multiligament-injured knee is controversial. Although many authors advocate operative treatment, uncertainty still exists as to whether surgical management yields improved results.[1-4,23] Our review suggests that patients receiving operative treatment have improved functional outcomes when compared with a nonoperative course. The literature provides many examples of both repair and reconstruction of damaged ligamentous knee structures. In this systematic review, patients had similar functional outcomes whether the ACL/PCL and PLC were repaired or reconstructed. However, the failure rate of PLC repairs was significantly higher than that of those that were reconstructed. Concerning the timing of surgery, patients receiving operative treatment within 3 weeks of their multiligamentous injuries had better functional outcomes than those whose treatment was delayed.

Operative Versus Nonoperative Management

Few recent studies in the literature have directly compared surgical treatment of multiligament knee injuries with nonoperative management,[16,23,25,26] which consists primarily of closed immobilization (i.e., casting or external fixation).[1] From 1972 to 1995, Taylor et al.,[12] Thomsen et al.,[22] and Montgomery et al.,[21] among others, have previously published findings in favor of conservative management. In contrast, literature published from 1995 to 1999 has supported operative treatment.[15,18,19,23] As a result, the question remains as to whether surgical or nonoperative management of the multiligament-injured knee is preferred.[1,34]

Certain injuries associated with multiligament trauma necessitate immediate surgical intervention, including open dislocations, irreducible dislocations, and popliteal artery damage.[1,34-36] For multiligament-injured knees without these sequelae, several studies published primarily from 1930 to 1990 are often quoted in support of nonsurgical management.[12,22] A meta-analysis by Dedmond and Almekinders[23] encompassing these studies found that operative treatment yielded statistically higher final Lysholm scores and ROM compared with conservative treatment. The authors note, however, that many of the earlier studies did not incorporate Lysholm scores as an outcome measure. In the nearly 2 decades since the publication of these nonoperative reports, numerous rehabilitation protocols and surgical techniques addressing multiligament knee injury have been developed.[37,38] Although the study did not meet the inclusion criteria, a subgroup analysis of 23 multiligament-injured knees by Werier et al.[39] showed that the mean Lysholm score in the reconstructed group was 80 compared with 56 in the nonoperative group ($P < .04$).

Repair Versus Reconstruction

Controversy also exists about whether to repair or reconstruct the damaged structures in a multiligament-injured knee. In a study by Fanelli and Edson,[40] 35 patients underwent combined arthroscopically assisted reconstruction of the ACL/PCL, with a mean Lysholm score of 91 at a minimum of 24 months' follow-up. Owens et al.[24] reported on 25 dislocated knees that underwent primary repair of all damaged ligaments, and they showed a mean Lysholm score of 89 at a mean of 48 months' follow-up. Several other authors have reported success using varied surgical techniques to repair or reconstruct the ligaments of the knee.

Stannard et al.[27] recently reported results of a prospective trial that directly compared repair versus reconstruction of the PLC in 57 knees, 44 (77%) of which had multiligament injury. The minimum follow-up was 24 months. The repair failure rate was 37%, compared with a reconstruction failure rate of 9%. The difference in stability on clinical examination between repairs and reconstructions was significant ($P < .05$). Mariani et al.[28] found no difference in functional outcomes when comparing primary repair versus reconstruction of combined ACL/PCL injuries but noted a greater degree of flexion loss and PCL instability and lower rate of return to preinjury activity levels in those who had primary repair of the cruciate ligaments.

There are several recent publications that did not meet our criteria for inclusion in this review but that did address either repair or reconstruction of multiligament knee injury and therefore merit attention. Richter et al.,[26] included in this review in the "oper-

ative versus nonoperative management" sections, provided a subgroup analysis of patients who underwent transosseous fixation versus reconstruction of the ACL/PCL. The study did not find any statistical outcome difference in Lysholm, percent IKDC, or Tegner scores between groups. Shelbourne et al.[41] recently reported favorable results with repair of lateral-side knee structures. Seventeen patients had mean IKDC and Noyes scores of 91 and 93 at 55 months' follow-up. Of the 16 patients injured during sports, 13 (81%) were able to return to the same level of activity. Complications were not mentioned in the article. Fanelli and Edson[42] published 2- to 10-year results of 41 patients whose PLC injuries were instead reconstructed. The mean postoperative Lysholm and Hospital for Special Surgery scores were 92 and 89, with no revisions required. All patients returned to their desired activity levels.

Early Versus Delayed Surgery

The timing of surgery is also a controversial topic.[34] Acute definitive surgical treatment generally occurs within 3 weeks of the multiligament knee injury, whereas chronic treatment may take place at any point beyond this demarcation.[29-32,41-43] Though somewhat arbitrary, 3 weeks has been considered a critical time period, when tissue planes can be identified during dissection and are of sufficient integrity to allow reapproximation (without retraction) and suture placement. This is particularly relevant on the lateral side, where aggressive scarring can interfere with the surgeon's ability to identify torn or avulsed anatomy. The few published studies offering direct comparison of surgical timing have typically shown greater improvement in functional and clinical outcomes with early treatment.[14,30-32] Other studies that address surgical management of chronic multiligament knee injuries report significant improvement and a return to activity for many patients.[29,40,42,43] In a study by Karataglis et al.,[43] 16 patients (46%) with chronic multiligament deficiency were able to participate in sports after surgery, and 32 (91%) returned to work.

As mentioned previously, acute surgery cannot be avoided in certain cases of the multiligament-injured knee. Extensive soft-tissue loss or concomitant life-threatening injuries may likewise preclude early definite ligamentous treatment. It has been suggested that acute surgical management of combined ligament injury be avoided, because of a high incidence of arthrofibrosis.[33,34,44-47] Although the sequelae of this complication can be debilitating and should not be minimized, patients from our systematic review showed satisfactory final mean ROM and flexion loss, regardless of operative timing. These results may reflect current aggressive and multidisciplinary rehabilitation protocols.[43]

Although this systematic review suggests improved outcomes with early treatment, several studies not meeting the inclusion criteria report favorable results with delayed multiligamentous surgery. Karataglis et al.[43] studied 35 patients who received operative treatment at a mean of 32 months after injury. Sixty percent reported excellent or good outcomes at a mean of 40 months' follow-up. Fanelli and Edson[42] studied 41 PCL/PLC-injured patients who received treatment from 4 to 240 months after injury, with excellent functional results at a minimum of 24 months' follow-up. In contrast, Shelbourne et al.[41] performed a subgroup analysis of early versus late (>4 weeks) multiligamentous surgery and found statistically lower IKDC, Noyes, and activity level scores in the 4 delayed-treatment patients.

Comparison studies included in this review suggest that operative treatment of the multiligament-injured knee yields improved functional and clinical outcomes compared with nonoperative management, reconstruction of the cruciate and PLC ligamentous structures yields improved clinical outcomes compared with repair, and definitive operative treatment within 3 weeks of injury yields improved functional and clinical outcomes compared with delayed management.

It is very difficult to conduct prospective, comparative studies on multiligament knee injuries because of the heterogeneous nature of the injuries themselves. The patterns of ligamentous injury, associated pathologies (fractures and nerve and vascular injuries), and variable mechanisms of injury often make comparisons difficult or preclude comparison completely. Relatively few studies with lower levels of evidence, as well as small sample size, were the primary limitations of this systematic review. Randomized, prospective trials are needed for more definitive answers.

CONCLUSIONS

Our review suggests that early operative treatment of the multiligament-injured knee yields improved functional and clinical outcomes compared with nonoperative management or delayed surgery. Repair of the PLC may yield higher revision rates compared with reconstruction.

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