

Partial Tears of the Anterior Cruciate Ligament in Children and Adolescents*

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Background: The functional outcome after partial anterior cruciate ligament tears in children and adolescents treated without reconstruction has not been established.

Hypothesis: Nonreconstructive management of partial anterior cruciate ligament tears can be effective in certain pediatric patients.

Study Design: Prospective cohort study.

Methods: We studied 45 skeletally mature and immature patients 17 years of age or less who had an acute hemarthrosis, magnetic resonance imaging signal changes, grade A or B Lachman and pivot shift result, and an arthroscopically documented partial anterior cruciate ligament tears. All patients were treated without reconstruction, underwent a structured rehabilitator program, and were followed up for a minimum of 2 years.

Results: Fourteen patients (31%) underwent subsequent reconstruction. Significant associations with subsequent reconstruction included tears that were greater than 50%, predominantly posterolateral tears, a grade B pivot shift test result, and older chronologic and skeletal age. Among patients who did not require reconstruction, those with tears that were greater than 50% or predominantly posterolateral had significantly lower Lysholm, satisfaction, and Cincinnati Knee Scale scores.

Conclusions: Nonreconstructive management is recommended for partial anterior cruciate ligament tears in children and adolescents 14 years of skeletal age or younger with normal or near-normal Lachman and pivot shift results. Reconstruction is recommended in older athletes or in those with greater than 50% or predominantly posterolateral tears.

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Injury of the ACL among children and adolescents has received increased attention.^{2,3,7,14,18,20,21,25-30,32,33,35,37,44,45,51,53,57-63} Although the true incidence and prevalence of ACL tears in this population has not been established, these injuries are seen with increasing frequency. Injury of the ACL has been reported in 10% to 65% of children with acute hemarthrosis of the knee in series ranging from 35 to 138 patients.^{9,20,52,55}

A substantial proportion, 22% to 53%, of midsubstance ACL injuries in the pediatric population are partial tears, according to reports of series investigating 9 to 32 injuries.^{9,20,28} In general, the appropriate treatment for partial ACL tears is controversial, with reports of animal studies

and adult clinical series yielding mixed results.^{6,8,9,10-13,16,19,24,26,27,34,35,38,41,42,46,47,49,50,55,60} The treatment of partial ACL tears in children and adolescents has been even less well characterized.

In general, nonreconstructive management of complete ACL tears in the pediatric population has shown poor results, with reports of subsequent instability, meniscal injury, and decreased function.^{14,18,22,33,36,45} However, the prognosis for nonreconstructive management of partial ACL tears in children and adolescents has not been established. The purposes of this study were to determine the functional outcome of nonreconstructive management of partial ACL tears in children and adolescents and to identify risk factors for the need for subsequent ACL reconstruction.

MATERIALS AND METHODS

The protocol for this prospective cohort study was approved by the institutional review board. From 1989 to 1995, information regarding all patients 17 years of age or

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younger seen in the sports medicine division of a major tertiary-care children's hospital with a knee injury, an acute hemarthrosis, and MRI examination of the knee was entered into a computerized database. All patients were seen within 2 weeks of their knee injury (range, 1 to 13 days). Both skeletally mature and immature patients were included. Patients with partial or complete ACL tears, as indicated on MRI scans interpreted by radiologists, subsequently underwent arthroscopic examination by the senior author (LJM). Lachman and pivot shift tests were graded on physical examination performed under anesthesia according to criteria established by the International Knee Documentation Committee (Lachman side-to-side difference: grade A, -1 to 2 mm; grade B, 3 to 5 mm; grade C, 6 to 10 mm; grade D, more than 10 mm) (pivot shift: grade A, equal; grade B, glide; grade C, clunk; grade D, gross).¹⁵ Patients with a grade C or D (abnormal or severely abnormal) Lachman or pivot shift result underwent ACL reconstruction.

The study group was composed of patients with a Lachman and pivot shift result of grade A or B (normal or near-normal) who had arthroscopic evidence of a partial ACL tear and did not undergo ACL reconstruction. Treatment consisted of use of a hinged knee brace to prevent passive terminal extension for 6 weeks and active terminal extension for 12 weeks. Only touchdown weightbearing was permitted for 6 to 8 weeks. A physical therapy protocol was followed emphasizing hamstring muscle strengthening and permitting return to sports and active play at 3 months with the use of a functional knee brace.

Initial data collected for each patient included chronologic age, skeletal age determined by wrist and hand radiographs, skeletal maturity status determined by the presence of an open or closed physis on knee radiographs, sex, mechanism of injury, Lachman and pivot shift grade under anesthesia, concomitant injuries, extent of ACL injury, and location of ACL injury. Arthroscopic assessment of the ACL injury was performed by the senior author using visualization with a 30° arthroscope and extensive probing with the knee in the flexed and figure-of-four positions. Tears were classified dichotomously by the extent of injury (>50% or <50% of the cross-section of the ligament) and location of injury (predominantly anteromedial portion or predominantly posterolateral portion).

Patients were examined at 2 weeks, 6 weeks, 12 weeks, 6 months, and 12 months, and then at yearly intervals. Functional outcome was determined by a history of the need for subsequent ACL reconstruction, objective examination, Lysholm score (0 to 100),⁵⁴ the Cincinnati Sports Activity Scale score (0 to 100),⁴⁰ the Cincinnati Activities of Daily Living Scale score (0 to 120),⁴⁰ the Cincinnati Sports Function Scale score (120 to 300),⁴⁰ and patient satisfaction with the outcome (0 to 10).

Univariate intergroup comparisons were performed by using the two-sample Student's *t*-test for continuous variables, Fisher's exact test for categorical variables, and the Pearson correlation coefficient as a measure of association between continuous variables. Multivariate analysis was performed by using a logistic regression model with back-

ward selection to determine independent, multivariate risk factors for the need for subsequent reconstruction. Significance was evaluated based on the likelihood chi-square test. Survivorship analysis for freedom from subsequent reconstruction was performed by the Kaplan-Meier product limit method, and subgroups were compared by using the log rank test.²⁰ Ninety-five percent confidence intervals around survival estimates were determined by using Greenwood's formula.¹⁷ The Cox proportional hazards model was used to determine time-related risk factors independently predictive of the need for subsequent reconstruction. Statistical analysis was performed by using the SPSS (version 10.0, SPSS, Inc., Chicago, Illinois) and SAS (version 6.12, SAS Institute, Inc., Cary, North Carolina) software packages. All reported *P* values are two-tailed.

RESULTS

Descriptive Data

The study group was composed of 45 of 52 eligible patients with 45 involved knees (for a follow-up rate of 87%). Characteristics of the study group are listed in Table 1. Patients lost to follow-up did not differ significantly (*P* > 0.05) from the study group with respect to mean chronologic age (13.7 years), mean skeletal age (14.0 years), skeletal maturity (five skeletally immature, two skeletally mature), sex (three boys and four girls), Lachman examination grade (grade A, two patients; grade B, five patients), pivot shift examination grade (grade A, six patients; grade B, one patient), location of tear (predomi-

TABLE 1
Characteristics of the Study Group (N = 45)

Variable	Percentage	(N)
	44	(20)
	56	(26)
	59	(24)
	47	(21)
	13.9	(9.3 to 17.8) ^a
	14.3	(9.0 to 17.8) ^a
	60	(27)
	40	(18)
	89	(40)
	11	(5)
	24	(11)
	76	(34)
	82	(28)
	39	(17)
	66	(25)
	44	(20)
	38	(17)
	20	(9)

TABLE 2
Univariate Analysis of Variables Associated with Subsequent
ACL Reconstruction

Variable	Mean \pm SD	P value	
Chronologic age (years)			
No reconstruction	13.3 \pm 2.6	0.01*	
Reconstruction	16.3 \pm 1.9		
Skeletal age (years)			
No reconstruction	13.8 \pm 2.3	<0.01*	
Reconstruction	15.9 \pm 1.8		
	Percentage of patients with subsequent reconstruction		
	%	(N)	
Male	36	(7/20)	0.75
Female	28	(7/25)	
Skeletal maturity			
Immature	22	(6/27)	0.19
Mature	44	(6/18)	
Involved side			
Left	33	(8/24)	0.76
Right	29	(6/21)	
Concomitant meniscal injury			
No tear	29	(8/28)	0.74
Tear	36	(6/17)	
Pivot shift result			
Grade A	29	(9/40)	<0.01*
Grade B	100	(5/5)	
Lachman result			
Grade A	9	(1/11)	0.13
Grade B	38	(13/34)	
Extent of tear			
<50%	18	(5/28)	0.02*
>50%	53	(9/17)	
Location of tear			
Anteromedial	16	(4/26)	0.02*
Posterolateral	50	(10/20)	

* Statistically significant ($P < 0.05$).

nantly anteromedial, four patients; predominantly posterolateral, three patients), and extent of tear (<50%, three patients; >50%, four patients). The mean follow-up time for the patients in the study group was 6.1 years (range, 2.3 to 11.6). Sixteen patients were 9 to 12 years of age (8 male, 8 female), 17 were 13 to 15 years of age (8 male, 9 female), and 12 were 16 to 17 years of age (4 male, 8 female). Injuries occurred during sports or active play in 44 patients (98%) and during a bicycle-motor vehicle accident in 1 patient (2%). An acute hemarthrosis was noted in all patients.

All patients underwent MRI of the knee, with T1-weighted, proton density, and T2-weighted coronal, sagittal, and axial plane images (image thickness, 3 mm with 1-mm skip or 4 mm with 1-mm skip). A 1.5-T magnet was used with phase-array or linear receive-transmit extremity coils and without contrast medium. Injury to the ACL was identified by the interpreting radiologists in 42 of the 45 knees. The MRI diagnosis of a complete tear was made in 10 patients, and the diagnosis of a partial tear was made in 32 (sensitivity of the MRI diagnosis of partial ACL tear was 71%). The three knees that did not have an MRI interpretation of ACL injury had an MRI diagnosis of

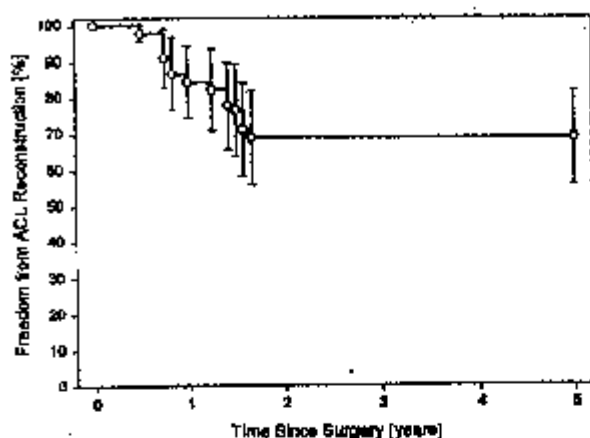


Figure 1. Kaplan-Meier survivorship curve for overall freedom from subsequent ACL reconstruction. Error bars indicate 95% confidence intervals.

a meniscal tear and were noted to have a partial ACL tear, in addition to a meniscal tear, at the time of the arthroscopic examination. The mean time from injury to the arthroscopic examination was 39 days (range, 9 to 81).

There were 12 predominantly anteromedial and 4 predominantly posterolateral tears in the 9- to 12-year-old group, 8 predominantly anteromedial and 9 predominantly posterolateral tears in the 13- to 15-year-old group, and 5 predominantly anteromedial and 7 predominantly posterolateral tears in the 16- to 17-year-old group. Forty-three tears (96%) were proximal and two tears (4%) were midsubstance.

Seventeen patients (38%) had 20 concomitant meniscal injuries (13 medial and 7 lateral meniscal tears) and 9 patients (20%) had concomitant grade II medial collateral ligament sprains characterized by increased valgus laxity under anesthesia with a firm end point. On the basis of the type and location of the tear, 13 meniscal tears were treated with partial meniscectomy and 7 were treated with meniscal repair by using an inside-out technique with No. 2-0 nonabsorbable suture or an all-inside technique with bioabsorbable meniscal arrows. Patients with medial collateral ligament sprains or partial meniscectomies underwent the same rehabilitation program as patients with isolated partial ACL tears. Patients who had meniscal repair underwent similar rehabilitation, with the addition of a limit of 90° of flexion for the first 6 weeks.

Subsequent ACL Reconstruction

Fourteen patients (31%) underwent subsequent ACL reconstruction because of symptoms of instability and reinjury episodes during sports or active play. One patient experienced reinjury during a gym class, and 13 were reinjured when they were involved in organized, competitive athletics, including soccer, basketball, football, baseball, gymnastics, skiing, and dancing. The mean time from the initial injury to the reconstruction was 13.5 months

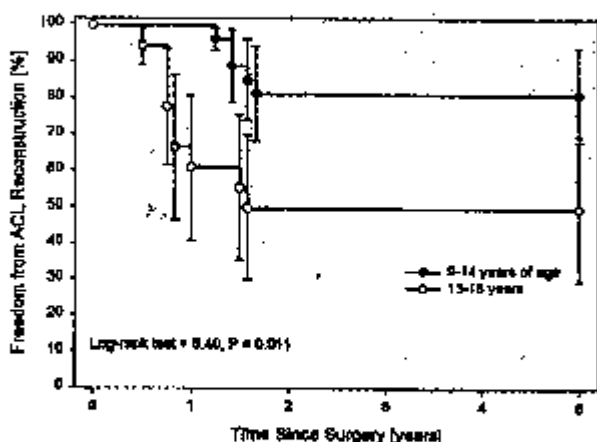


Figure 2. Kaplan-Meier survivorship curve for freedom from subsequent ACL reconstruction according to skeletal age group (ages 9 to 14 and 15 to 18 years). Error bars indicate 95% confidence intervals.

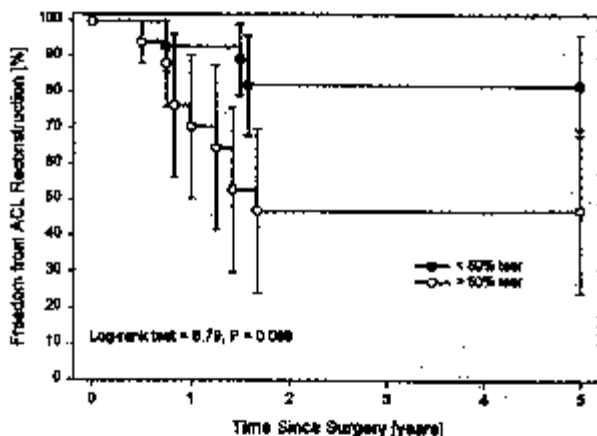


Figure 3. Kaplan-Meier survivorship curve for freedom from subsequent ACL reconstruction according to extent of tear (<50% tear, ≥50% tear). Error bars indicate 95% confidence intervals.

(range, 6.0 to 19.5). The mean time from the end of non-reconstructive management to reconstruction was 9.8 months (range, 2.8 to 15.2). At the reconstruction, all of the patients were noted to have a complete midsubstance tear of the ACL with lack of continuity. Autogenous gracilis-semitendinosus tendon graft was used in eight patients and autogenous bone-patellar tendon-bone graft in six.

Univariate analysis identified significant associations between the need for subsequent ACL reconstruction and tears of greater than 50%, predominantly posterolateral tears, grade B pivot shift examination result, older chronologic age, and older skeletal age (Table 2). There were no significant associations between subsequent need for ACL reconstruction and sex, skeletal maturity status, Lachman result, involved side, or concomitant meniscal injury.

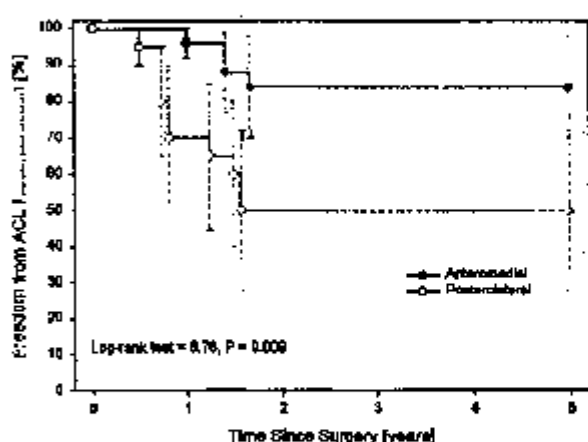


Figure 4. Kaplan-Meier survivorship curve for freedom from subsequent ACL reconstruction according to location of tear (predominantly anteromedial, predominantly posterolateral). Error bars indicate 95% confidence intervals.

Multivariate analysis identified only tears of more than 50% ($P = 0.02$) and posterolateral tears ($P = 0.049$) as significant, independent, multivariate predictors of subsequent ACL reconstruction in the multiple logistic regression model (adjusted $r^2 = 0.38$). Chronologic age ($P = 0.19$), skeletal age ($P = 0.11$), skeletal maturity status ($P = 0.09$), sex ($P = 0.66$), involved side ($P = 0.31$), Lachman result ($P = 0.65$), and concomitant meniscal injury ($P = 0.75$) were not significant independent, multivariate risk factors for subsequent reconstruction. A grade B pivot shift result, which had a significant univariate association with subsequent reconstruction, lost significance in the multivariate model because of confounding with location of tear (grade A pivot shift, 38% of posterolateral tears [15 of 25]; grade B pivot shift, 100% of posterolateral tears [5 of 5]; $P = 0.01$). Older chronologic and skeletal age, which had significant univariate associations with subsequent reconstruction, lost significance in the multivariate model because of confounding with location of tear (chronologic age: anteromedial tears, 13.3 ± 2.5 years of age; posterolateral tears, 14.6 ± 2.6 years of age; $P = 0.11$) (skeletal age: anteromedial tears, 13.5 ± 2.9 years of age; posterolateral tears, 14.9 ± 3.1 year of age; $P = 0.13$).

Survivorship analysis (Fig. 1) identified older skeletal age ($P = 0.01$) (Fig. 2), a tear of more than 50% ($P = 0.01$) (Fig. 3), and posterolateral tear ($P = 0.01$) (Fig. 4) as significant time-dependent risk factors for subsequent ACL reconstruction. Chronologic age ($P = 0.09$), skeletal maturity status ($P = 0.16$), sex ($P = 0.79$), involved side ($P = 0.76$), concomitant meniscal injury ($P = 0.64$), and Lachman result ($P = 0.07$) were not significant time-dependent risk factors for subsequent reconstruction.

Patients Not Requiring Subsequent ACL Reconstruction

At the follow-up examination of patients who did not undergo subsequent ACL reconstruction (31 of 45) a mean of

TABLE 3
Outcome Measures for Patients Who Did Not Undergo Subsequent ACL Reconstruction ($N = 31$)

Variable	Lysholm score (1-100)		Patient satisfaction (0-10)		Sports activity scale (0-100)		Activities of daily living scale (0-100)		Sports function scale (120-300)	
	Mean (SD)	P	Mean (SD)	P	Mean (SD)	P	Mean (SD)	P	Mean (SD)	P
Sex										
Male	86.0 (11.9)	0.86	8.6 (1.3)	0.12	92.7 (10.9)	0.65	113.6 (13.9)	0.96	281.5 (23.8)	0.96
Female	91.4 (7.8)		9.2 (0.9)		94.2 (6.7)		113.3 (12.1)		282.2 (29.3)	
Chronologic age	$r = -0.04$	0.83	$r = -0.08$	0.67	$r = -0.04$	0.83	$r = -0.32$	0.20	$r = -0.02$	0.86
Skeletal age	$r = -0.06$	0.78	$r = -0.10$	0.58	$r = -0.06$	0.78	$r = -0.23$	0.20	$r = -0.04$	0.83
Meniscal injury										
No	91.5 (8.4)	0.26	9.2 (0.9)	0.21	95.9 (6.4)	0.14	118.2 (8.0)	0.11	288.0 (18.8)	0.09
Yes	87.3 (11.5)		8.6 (1.4)		90.5 (11.3)		105.0 (16.4)		270.9 (36.2)	
Lachman result										
Grade A	89.8 (10.9)	0.94	8.8 (1.1)	0.56	95.0 (11.6)	0.53	117.0 (6.8)	0.25	286.0 (23.2)	0.57
Grade B	90.1 (9.3)		9.1 (1.1)		92.9 (7.0)		108.6 (16.8)		280.0 (29.0)	
Extent of tear										
<50%	94.1 (4.0)	0.01*	9.8 (0.7)	0.04*	96.1 (5.2)	0.06	120.0 (0)	0.04*	290.4 (16.9)	<0.01*
>50%	78.1 (11.4)		8.0 (1.4)		86.3 (12.1)		106.3 (15.1)		257.5 (36.2)	
Location of tear										
Anteromedial	94.5 (3.0)	0.01*	9.3 (0.5)	0.04*	98.4 (5.0)	0.04*	118.9 (3.3)	0.08	290.5 (16.3)	0.01*
Posterolateral	80.6 (12.1)		8.2 (1.5)		87.5 (11.4)		107.5 (15.2)		284.0 (36.3)	

* Statistically significant at $P < 0.05$.

59.1 months (range, 29 to 111) after injury, Lachman examination demonstrated grade A laxity in 13 patients (42%) and grade B laxity in 18 patients (58%); none of these patients had grade C or D laxity. Pivot shift examination demonstrated grade A in 30 patients (97%) and grade B in 1 patient (3%); none had grade C or D. Those patients with initial tears of greater than 50% had significantly lower Lysholm scores, patient satisfaction scores, Cincinnati Activities of Daily Living Scale scores, and Cincinnati Sports Function Scale scores (Table 3). Those with predominantly posterolateral initial tears had significantly lower Lysholm scores, patient satisfaction scores, Cincinnati Sports Activity Scale scores, and Cincinnati Sports Function Scale scores (Table 3). There were no significant differences in outcome variables for sex, chronologic age, skeletal age, concomitant meniscal injury, or initial Lachman examination score ($P > 0.05$) (Table 3).

DISCUSSION

The results of nonreconstructive management of complete ACL tears in children and adolescents are, in general, poor. Graf and coworkers¹⁴ reported poor results at 15 months, with new meniscal tears and episodes of instability in seven of eight skeletally immature patients who did not undergo reconstruction or activity limitations. Similarly, in a series of 18 skeletally immature patients examined an average of 51 months after a complete ACL tear, Mizuta and coworkers³⁶ found that all had symptoms, only 1 had returned to the preinjury sports level, 8 had developed secondary meniscal tears, and 11 had developed radiographic changes. Janarv and colleagues¹⁸ found that 16 of 23 skeletally immature patients treated with rehabilitation eventually needed reconstruction. Those who did not require reconstruction were younger and less active. McCarroll and colleagues³² found better results for surgical management of complete ACL tears in prepubes-

cent and junior high school patients. Of 16 prepubescent patients treated nonoperatively, 9 ceased sports participation, 4 sustained at least 1 reinjury, and only 3 were able to return to sport. Of 24 patients treated surgically, 22 returned to sport. In a separate group of 76 junior high school athletes with midsubstance tears, McCarrull and colleagues³⁸ reported that 37 of 38 patients who were initially treated nonoperatively (97%) reported instability and 27 (71%) developed meniscal tears. Overall, 92% of those treated with reconstruction (56 of 60) returned to sport. Similarly, Pressman and coworkers⁴⁵ also found more stable and functional knees in children with a complete tear of the ACL who underwent reconstruction.

A substantial proportion of midsubstance ACL injuries in children and adolescents are partial tears.^{9,23,29} Partial ACL tears have been well characterized in adults.^{5,6,8,10-12,18,19,23-27,34,35,38,41,42,45,47,49,50,55,60} The appropriate management of partial ACL tears is controversial. Studies using canine, rat, and goat models have demonstrated mixed results regarding the healing potential of partial ACL transection.^{4,21,39,43} Some clinical series in adults, ranging from 11 to 41 patients with a mean follow-up of 8 to 20 years, have reported almost uniformly successful results from the nonoperative management of partial tears, with good-to-excellent functional outcome, maintenance or some reduction of activity level, and minimal increase in laxity.^{19,39,42,44,60} Others have suggested that partial tears really represent functionally complete injuries with a resultant poor prognosis.^{16,37} Accordingly, reports of some clinical series in adults have identified a subset of patients with partial tears who have progressed to ACL deficiency and a poor result with nonoperative management. Fritschy et al.,¹¹ Bak et al.,⁵ Lehnert et al.,²⁸ Barrack et al.,⁶ and Fruensgaard and Johannsen¹² reported subsequent ACL deficiency rates of 14% to 56% in series of 35 to 56 adult patients followed for 1.5 to 5.3 years after nonoperative management of partial tears. These authors

found subsequent ACL reconstruction rates of 11% to 14%, with a general decrease in activity level of patients who did not undergo reconstruction.^{5,9,12} Noyes and colleagues⁴¹ reported a 38% deficiency rate in 32 patients with arthroscopically documented partial tears who had been followed for 5.7 years. They found three factors associated with subsequent ACL deficiency: the extent of the partial tear, increased anterior tibial translation, and reinjury episodes.

Nonreconstructive management of partial ACL tears in children and adolescents is an attractive option because of the enhanced healing potential of children, the risk of growth disturbance with reconstruction in skeletally immature patients, and the prevalence of partial tears. However, the prognosis for nonreconstructive management of partial tears in pediatric patients has not been established, and risk factors for a poor prognosis have not been identified. In the current study, we found a 31% rate of subsequent ACL reconstruction because of instability and reinjury. Survivorship risk factors for subsequent reconstruction included older skeletal age, tears that were greater than 50%, and posterolateral tears. Among patients who did not undergo subsequent ACL reconstruction, those with tears that were more than 50% or posterolateral had diminished functional outcome. Potential hypotheses regarding the poorer prognosis of tears greater than 50%, posterolateral tears, and tears in older adolescents include the greater extent of ligament injury in larger tears, the biomechanical and vascular importance of the posterolateral bundle, and a decline of the enhanced healing ability seen in younger children.^{1,4,13,45}

Limitations of this study include the subjective nature of arthroscopic classification of the extent and location of partial tears. Although it can be difficult to systematically evaluate and classify the extent and location of a partial tear arthroscopically, this assessment was made by one experienced observer and the ligament was thoroughly visualized and probed with the knee in both the flexed and figure-of-four position. Injuries were classified in a dichotomous manner (more than 50% compared with less than 50%, predominantly anteromedial compared with posterolateral) because delineation into multiple, smaller groupings was thought to be unreliable.

In this study, both skeletally immature and mature patients were included to assess the association of chronologic age, skeletal age, and skeletal maturity with outcome. In point of fact, older skeletal and chronologic age had significant univariate associations with subsequent reconstruction, and older skeletal age was a time-dependent risk factor for subsequent reconstruction. On the other hand, skeletal maturity status, based on open compared with closed physes at the knee, was not a significant univariate, multivariate, or survivorship risk factor for subsequent reconstruction. Thus, we report on both skeletally immature and mature adolescents, as opposed to limiting this study only to immature patients. This lack of significance for skeletal maturity as compared with the significance for skeletal and chronologic age may be due to true insignificance or due to the relative lack of power associated with a dichotomous variable (skeletal matu-

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riety) compared with continuous variables (skeletal and chronologic age). Alternatively, maturity can be measured ordinally via Tanner staging for secondary sexual characteristics or via a more descriptive characterization of the physes at the knee (such as wide open, open, near-closing, closing, closed). Unfortunately, we were unable to assess the prognostic value of these systems because these data were not routinely collected and recorded.

It should be reiterated that this was a selected patient population consisting of those with an arthroscopically documented partial ACL tear and a normal or near-normal (grade A or B) initial Lachman and pivot shift examination result under anesthesia. Patients with abnormal or severely abnormal (grade C or D) Lachman or pivot shift results were treated with reconstruction. Thus, the findings from this selected study population may not be generalizable to those with substantial instability on examination. In this study, subsequent ACL reconstruction was used as a clinical end point. Although there is subjectivity in the decision to perform ACL reconstruction, all patients who underwent subsequent reconstruction had symptoms of instability and had reinjury episodes.

In conclusion, we advocate consideration of nonreconstructive management of partial ACL tears in children and adolescents 14 years of skeletal age or less with normal or near-normal Lachman and pivot shift examination results because of the prognosis for a relatively low rate of subsequent instability requiring reconstruction. We do not recommend routine arthroscopic evaluation of suspected partial ACL tears. This procedure was performed in our patients within a study protocol. Appropriate patients can be identified on the basis of a history of injury with acute hemarthrosis, MRI exhibiting signal changes within the ACL, and a physical examination demonstrating normal or near-normal Lachman and pivot shift results. We recommend consideration of ACL reconstruction in older adolescents (15 to 17 years of age) and, if arthroscopic surgery is performed, in those with tears that are greater than 50% or predominantly posterolateral, given the associations with subsequent need for reconstruction and the worse functional outcome in patients treated nonoperatively.

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