Effect of Lateral Extra-Articular Procedures Combined With ACL Reconstruction on the Rate of Graft Rupture in Patients Aged Older Than 30 Years

A Matched-Pair Analysis of 1102 Patients From the SANTI Study Group

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Background: Clinical studies have demonstrated significant advantages of combined anterior cruciate ligament (ACL) reconstruction (ACLR) and lateral extra-articular procedures (LEAPs) over isolated ACLR in terms of reducing graft rupture and reoperation rates. However, most of the published studies have included young patients, and no studies have focused on patients aged >30 years.

Purpose/Hypothesis: The purpose of this study was to compare the outcomes of isolated ACLR versus ACLR + LEAP at midterm follow-up in patients aged >30 years. The hypothesis was that patients who underwent combined procedures would experience significantly lower rates of graft rupture.

Study Design: Cohort study; Level of evidence, 3.

Methods: Patients >30 years of age who underwent primary ACLR + LEAP between January 2003 and December 2020 were propensity matched at a 1:1 ratio to patients who underwent isolated ACLR. A retrospective analysis of prospectively collected data was performed to determine graft rupture rates, knee stability, reoperation rates, and complications. Graft survivorship was assessed using the Kaplan-Meier method. Risk factors associated with the occurrence of graft failure were analyzed using a Cox proportional hazards model.

Results: Two groups of 551 patients each were included in the study, and the mean follow-up was 97.19 ± 47.23 months. The overall mean age was 37.01 ± 6.24 years. The LEAP group consisted of 503 (91.3%) patients who had anterolateral ligament reconstruction and 48 (8.7%) patients who had a Lemaire procedure. Overall, 19 (1.7%) patients had graft failure: 15 (2.7%) in the no-LEAP group and 4 (0.7%) in the LEAP group (P = .0116). The risk of graft failure was significantly associated with the absence of LEAP (31 vs 12; hazard ratio, 3.309; 95% CI, 1.088-10.065; P = .0350) and age between 30 and 35 years (hazard ratio, 4.533; 95% CI, 1.484-13.841; P = .0080). A higher rate of reoperation for secondary meniscectomy was found in the no-LEAP group (5.6% vs 2.2%; P = .0031).

Conclusion: Patients aged >30 years who underwent combined ACLR and LEAP experienced a >3-fold lower risk of ACL graft failure compared with those who underwent isolated ACLR. Furthermore, the group without LEAP experienced a higher rate of secondary meniscectomy.

Keywords: ACL reconstruction; anterolateral ligament reconstruction; lateral extra-articular procedures; long-term follow-up

The recent identification of the anterolateral ligament (ALL) has renewed interest in the biomechanics of the knee joint and its implications for anterior cruciate ligament (ACL) reconstruction (ACLR).[4] The ALL is part of the anterolateral complex, and recent evidence suggests that these structures are critical for controlling rotational stability, which may have significant implications for ACLR outcomes.[12,32,44] This discovery has led to renewed focus on lateral extra-articular procedures (LEAPs), which

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were widespread in the past but lost relevance with advances in intra-articular ACLR techniques.[39] The protective function of LEAPs could be attributed to load sharing with the ACL graft, resulting in reduced stress on the ACL graft by improving overall knee stability, potentially reducing the likelihood of graft rerupture.[6,25] These biomechanical properties result in better postoperative knee stability and a protective effect on the ACL graft and the menisci.[3,12,25,34,39] A growing body of literature demonstrates the increasing indications for combined ACLR and LEAP, considering the evident benefits in patients with risk factors for rerupture. These include patients who participate in rotational sports, have undergone revision ACLR, have high-grade rotational instability, and are young.[9,40] However, the exact indications for combined ACL and LEAP have not been clearly defined, especially regarding patient age. In fact, despite the resurgence in popularity of combined procedures, few long-term studies exist, and most of them include young patients exclusively.[21,26,33,37] However, a recent nationwide database analysis encompassing all age groups revealed that 30% of ACLR procedures were performed on individuals aged >30 years.[20] To our knowledge, no studies on combined ACLR and LEAP have focused on individuals >30 years of age. This highlights the need to identify the optimal surgical treatment and determine whether there is a place for LEAPs in the subgroup of the population that is not strictly considered "young." Therefore, the purpose of the current study was to determine whether ACLR combined with LEAP would result in a lower rate of ACLR failure than ACLR alone in patients aged >30 years. The hypothesis was that combined ACLR and LEAP would result in a lower risk of graft rupture than ACLR alone, even in patients >30 years of age.

METHODS

Study Design and Participants

The study was designed as a retrospective, nonrandomized, match-paired comparative study. Institutional review board approval was granted (COS-RGDS-2023-10-006-SONNERY-COTTET-B). A retrospective analysis of prospectively collected data from the (SANTI Study Group database) was performed. Patients aged >30 years who underwent primary ACLR between January 2003 and December 2020 were considered for study eligibility. All patients had experienced a knee injury with clinical signs of an ACL tear; in all cases, the diagnosis was confirmed by magnetic resonance imaging. Autograft selection and whether a LEAP was performed were determined by patient preference and the surgeon's evolving indications for LEAPs during the study period. The indications for combined procedures increased over the study period and included a grade 3 pivot shift, chronic injuries, hyperlaxity, and participation by young patients in pivoting sports. The scope of indications was broadened because of the positive clinical outcomes we achieved. Pivoting sports were defined as level I or level II sports according to the activity level classification by Hefti et al,[15] modified to European sport activities.[14] The exclusion criteria were as follows: patients with previous ipsilateral knee surgery, multiligamentous injuries involving ligaments other than the ACL or ALL and requiring surgical treatment, concomitant osteotomy, or any additional procedure for cartilage lesions during the time of ACLR.

All surgical procedures were performed by a single senior surgeon (B.S.-C.). ACLRs were performed using a bone–patellar tendon–bone (BPTB) autograft[11,22] with or without a modified Lemaire procedure,[16,18] a hamstring tendon (HT) autograft[43] with or without a modified Lemaire procedure or an ALL reconstruction (ALLR),[41] or a quadriceps tendon (QT) autograft.[31]

The methods for femoral fixation varied, including press-fit fixation for BPTB grafts, adjustable-loop cortical suspensory fixation (Tightrope; Arthrex) for HT grafts alone, and the use of interference screws for QT grafts as well as combined ACLR + ALLR using HT grafts (FastThread BioComposite Interference Screws; Arthrex).

For both tibial fixation—regardless of graft type—and femoral fixation of the Lemaire procedure, interference screws have been the standard choice. The ALLR was fixed using the suture ends of the ACL graft, tied around the ALL graft in extension and neutral rotation.

Postoperative Rehabilitation Protocol

The same rehabilitation protocol was used for all patients regardless of the surgical technique. This consisted of brace-free, immediate full weightbearing and progressive range of motion exercises. Patients who underwent meniscal repair had restriction in weightbearing and in range of motion of 0° to 90° for 6 weeks. Early rehabilitation focused on quadriceps activation and early restoration of full terminal extension. A gradual return to sports activities was allowed starting 4 months after surgery for nonpivoting sports (ie, running, cycling), 6 months for pivoting

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noncontact sports (ie, tennis, skiing), and 8 to 9 months for pivoting contact sports (ie, soccer, rugby). In addition to receiving this standard rehabilitation protocol, all patients were offered the opportunity to participate in an individualized return-to-sport program.[10] However, not all patients participated in this program because it was an adjunct to standard rehabilitation and was delivered by a private provider.

Follow-up and Data Collection

Postoperative follow-up was scheduled at 3 and 6 weeks and 3, 6, 12, and 24 months. Follow-up was then conducted annually. The conclusion of the study was defined as February 2023. For each participant, final follow-up was defined as the most recent follow-up before this date, according to data collected prospectively in the SANTI Study Group database. The last follow-up consisted of an evaluation of the anteroposterior side-to-side laxity difference as measured by the Rolimeter (Aircast Europa), Lachman test, and pivot-shift examination. Graft failure was defined by the following criteria: giving-way episodes, side-to-side difference >4 mm using Rolimeter, magnetic resonance imaging confirmation, and/or ACLR revision. Patient notes were reviewed by an investigator, (F.P., A.A.A., A.A. or M.B.) independent of the primary surgeon, to determine whether patients had sustained a further ipsilateral knee injury, had sustained a contralateral knee injury, had undergone any reoperations, or had experienced any complications after the index procedure.

Propensity Score Matching and Statistical Analysis

Propensity score matching in a 1:1 ratio was undertaken to mitigate the effects of any possible treatment selection bias and allow the creation of 2 groups (isolated ACLR, ACLR + LEAP) in which confounding factors were balanced. A propensity score was determined for each patient based on the following criteria: age, body mass index, sex, and participation in pivoting sports. After generation of the scores, patients who underwent combined ACLR + LEAP were individually matched with patients who underwent isolated ACLR according to the closest corresponding propensity score (optimal algorithm: Mahalanobis distance)[26] with a 0.10 caliper, 95% CI, and a tolerance of 0.001. Data analysis was conducted depending on the nature of the considered criteria. For qualitative data, comparisons were made using the chi-square test or Fisher exact test, according to the expected values under the assumption of independence. Comparisons of paired data were made using the McNemar test. For quantitative data, comparisons were made using Student *t* test or Mann-Whitney-Wilcoxon test (nonparametric test comparing ranks) depending on the distribution of the variable of interest. Comparisons of paired data were made using Student *t* test (parametric test) or Wilcoxon test (nonparametric test) depending on the distribution of the variable of interest. The risk of graft failure was described in terms of the probability of occurrence and confidence interval using the Kaplan-Meier method. The different groups were compared using the log-rank test. Cox proportional hazards regression model was used to perform adjusted analysis of risk factors associated with occurrence of graft failure per unit exposure time in order to account for significant between-group differences. All comparisons were performed at the level of statistical significance set at $P < .05$. All calculations were made with SAS for Windows (Version 9.4; SAS Institute Inc).

TABLE 1
Absolute Standardized Differences for Each Variable Used in Propensity Matching[a]

	Value	SE
Age	–0.278	0.032
Body mass index	0.011	0.029
Sex	0.053	0.031
Pivoting sport	0.032	0.028

[a]Caliper 0.10; 95% CI; tolerance 0.001.

RESULTS

Patient and Clinical Characteristics

After application of the inclusion and exclusion criteria, 1102 patients >30 years of age were identified. Patients were separated into 2 groups: 551 patients (50%) in the ACLR + LEAP group and 551 patients (50%) in the isolated ACLR group. All patients in the ACL + LEAP group were propensity matched to a single best-matched patient from the isolated ACLR group. Propensity matching proved effective in reducing bias, as demonstrated by a caliper of 0.10, a 95% CI, and a tolerance of 0.001, ensuring that the groups were sufficiently comparable to allow for reliable comparisons (Table 1).

The overall mean age at the time of surgery was 37.01 ± 6.24 years (37.03 ± 6.34 for the ACLR + LEAP group and 37.00 ± 6.14 years for the isolated ACLR group). Demographic data are reported in Table 2.

The time from the injury to surgery was 22.17 ± 47.61 months: 29.58 ± 55.55 months for the combined ACLR and LEAP group and 14.68 ± 36.47 months for the isolated ACLR group ($P < .0001$). Table 3 presents the descriptive data for patients with and without graft failure.

Table 4 summarizes the surgical procedures performed: 610 of 1102 patients (55.4%) had associated meniscal lesions, 337 patients (61.2%) in the combined ACLR and LEAP group and 273 patients (49.5%) in the isolated ACLR group ($P < .0001$).

Clinical Outcomes

The overall mean follow-up was 97.19 ± 47.23 months. Overall, 19 graft ruptures (1.7%) were observed: 4 (0.7%) in the combined ACLR and LEAP group and 15 (2.7%) in

TABLE 2
Demographic Characteristics of the Analyzed Population[a]

	Isolated ACLR (n = 551)	Combined ACLR and LEAP (n = 551)	*P*
Age at the time of surgery, y	37.00 ± 6.14	37.03 ± 6.34	.72
Age group			
>30-34 years	245 (44.5)	251 (45.6)	.41
≥35 years	306 (55.5)	300 (54.4)	
Sex			
Male	145 (26.3)	139 (25.2)	.63
Female	406 (73.7)	412 (74.8)	
Body mass index	24.60 ± 3.23	24.58 ± 3.37	.87
Preoperative side-to-side laxity, mm	6.4 ± 2.1	6.8 ± 2.3	**.0103**

[a]Data are presented as mean ± SD or n (%). Boldface indicates statistical significance. ACLR, anterior cruciate ligament reconstruction; LEAP, lateral extra-articular procedure.

TABLE 3
Descriptive Analysis of Factors Associated With Graft Failure (N = 1102)[a]

	No Graft Failure (n = 1083)	Graft Failure (n = 19)
LEAP		
No	536 (97.3)	15 (2.7)
Yes	547 (99.3)	4 (0.7)
Age group		
>30-34 y	481 (97.0)	15 (3.0)
≥35 y	602 (99.3)	4 (0.7)
Sex		
Male	280 (98.6)	4 (1.4)
Female	803 (98.2)	15 (1.8)
Time between injury and surgery		
<3 mo	393 (97.5)	10 (2.5)
3-12 mo	393 (98.5)	6 (1.5)
>12 mo	281 (98.9)	3 (1.1)
Missing	16	0
Pivot sport		
No	207 (98.6)	3 (1.4)
Yes	876 (98.2)	16 (1.8)
Meniscal lesion		
No	484 (98.4)	8 (1.6)
Yes	599 (98.2)	11 (1.8)

[a]Data are expressed as n (%). LEAP, lateral extra-articular procedure.

the isolated ACLR group (P = .0116). Among these, at the time of their first surgery, 5 patients received ACLR with BPTB graft, 12 with HT graft, and 2 with QT graft.

Kaplan-Meier analysis demonstrated better graft survivorship in the combined group than in the isolated group at every time point assessed (Figure 1). The same analysis demonstrated better graft survivorship in the group ≥35 years than in the younger patients (Figure 2). Overall, the survivorship of ACL grafts at 120 months was 98.0% (95% CI, 96.9-98.7); survivorship was 99.2% (95% CI, 97.9-99.7) and 97.1% (95% CI, 95.2-98.3) in the combined ACLR and LEAP group and the isolated ACLR group, respectively. Moreover, patients <35 years exhibited a relative risk of experiencing graft failure that was 4.533 times higher, with a 95% CI of 1.484 to 13.841.

TABLE 4
Surgical Procedures Performed[a]

	Isolated ACLR (n = 551)	Combined ACLR and LEAP (n = 551)
Isolated HT	466 (84.6)	0 (0.0)
HT + ALL	0 (0.0)	503 (91.2)
HT + Lemaire	0 (0.0)	45 (8.2)
BPTB	67 (12.1)	1 (0.2)
QT	18 (3.3)	2 (0.4)

[a]Data are presented as n (%). ALL, anterolateral ligament; ACLR, anterior cruciate ligament reconstruction; BPTB, bone–patellar tendon–bone; HT, hamstring tendon; LEAP, lateral extra-articular procedure; QT, quadriceps tendon.

Risk Factors for Reoperations and Complications

Subsequent meniscectomy after ACLR was reported in 43 patients (3.9%), which was significantly higher in the isolated ACLR group (31 patients; 5.6%) than in the combined ACLR and LEAP group (12 patients; 2.2%) (P = .0031) Specifically, 34 patients (3.1%) underwent medial meniscectomy, 26 (4.7%) in the isolated ACLR group and 8 (1.5%) in the combined ACLR and LEAP group; 10 patients (0.9%) underwent lateral meniscectomy, 6 (1.1%) in the isolated ACLR group and 4 (0.7%) in the combined ACLR and LEAP group.

Multivariate analysis was performed, including surgical technique, age group, sex, time between injury and surgery, pivoting sport, and meniscal lesion. The Cox model was used to estimate the risk of graft ruptures and to explore the relationships with potential explanatory variables. This analysis revealed that the risk of graft failure was significantly associated with LEAP and age. Patients who did not receive a LEAP had a greater risk of graft failure (hazard ratio, 3.309; 95% CI, 1.088-10.065; P = .035). In

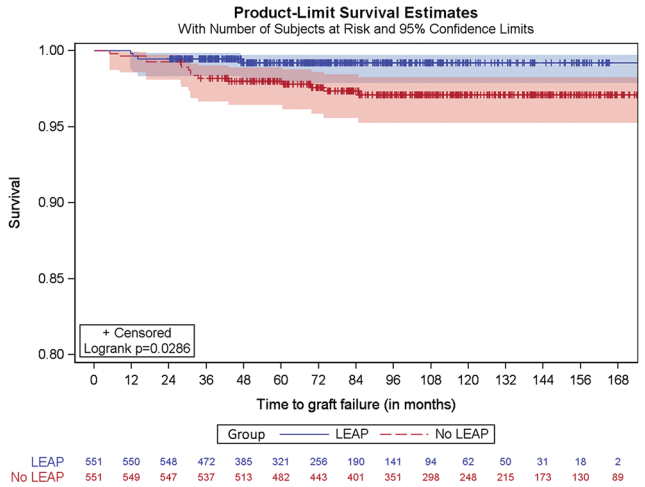

Figure 1. Kaplan-Meier plot demonstrating differences in graft survivorship between isolated and combined groups. A significant difference in graft survivorship is illustrated (P = .0286). LEAP, lateral extra-articular procedure.

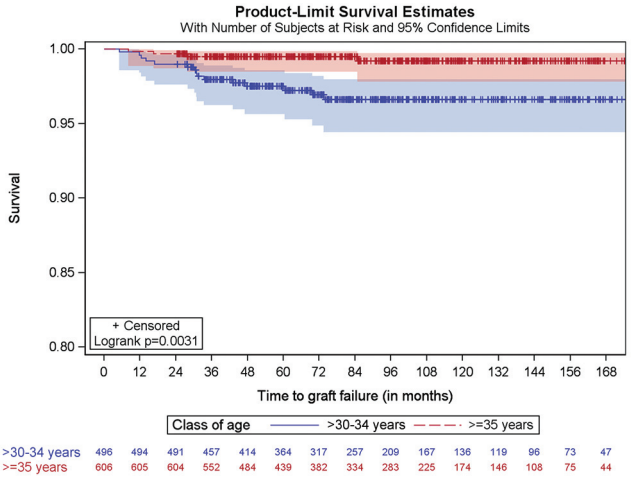

Figure 2. Kaplan-Meier plot demonstrating differences in graft survivorship between age groups. A significant difference in graft survivorship is illustrated (P = .0031).

TABLE 5
Multivariate Analysis: Adjusted Cox Model for Graft Failure[a]

Parameter	Value	HR and 95% CI	P
Surgical technique	No LEAP	3.309 (1.088-10.065)	**.035**
Age group	>30-34 years	4.533 (1.484-13.841)	**.008**
Sex	Female	1.071 (0.347-3.301)	.905
Delay between injury and surgery	<3 mo	1.853 (0.497-6.904)	.556
Delay between injury and surgery	3-12 mo	1.215 (0.295-5.000)	.556
Pivoting sport	No	0.984 (0.283-3.424)	.98
Meniscal lesion	Yes	1.446 (0.568-3.681)	.439

[a]Boldface indicates statistically significant values. HR, hazard ratio; LEAP, lateral extra-articular procedure.

addition, patients <35 years had a greater risk of graft failure (hazard ratio, 4.533; 95% CI, 1.484-13.841; P = .008) (Table 5).

DISCUSSION

The main finding of this study was that in patients who underwent ACLR combined with LEAP, the risk of graft failure was significantly reduced at a mean follow-up of 97 months. In the current study, patients >30 years who did not undergo LEAP had a >3-fold greater risk of graft failure compared with those who underwent combined ACLR and LEAP (2.7% vs 0.4%, respectively; P = .0116). The second finding of this study was that patients aged between 30 and 35 years had a >4-fold greater risk of graft failure compared with older patients. Furthermore, this study showed that patients who underwent combined ACLR and LEAP experienced a lower rate of secondary meniscectomy than those who underwent isolated ACLR (2.2% vs 5.6%, respectively; P = .0031). No significant differences were found between the groups regarding knee laxity or other complications.

Several studies have shown the importance of combining LEAP and ACLR to improve knee stability, reduce graft rupture rates, and increase graft survivorship regardless of the specific type of procedure.[33,47] The biomechanical importance of extra-articular tenodesis was shown by Engebretsen et al[6] in 1990 and more recently by Marom et al,[25] demonstrating the reduction in the forces transmitted to the ACL graft due to the presence of lateral tenodesis. In 1991, Noyes and Barber[30] reported a 16% rate of graft failure in patients undergoing isolated ACLR compared with 3% in patients undergoing ACLR combined with LEAP. More recently, Ferretti et al[8] found a significantly reduced rate of graft failure with the combined procedure at a minimum follow-up of 10 years. In a study conducted by Sonnery-Cottet et al[42] in 2021, which included a propensity-matched analysis of 86 pairs of patients with a mean age of 32.2 years and a mean follow-up of 8 years, the authors reported a graft failure

rate of 17.4% in patients receiving isolated ACLR compared with 3.5% in patients receiving ACLR combined with ALLR. These results were confirmed by the STABILITY Group randomized clinical trial by Getgood et al,[13] who reported, at 2 years of follow-up, an 11% failure rate with isolated ACLR with HT grafts compared with 4% when ACLR was combined with modified Lemaire tenodesis. At a mean 101-month follow-up, Pioger et al[34] demonstrated that patients who underwent isolated ACLR with a BPTB autograft experienced significantly worse graft survivorship and worse overall reoperation-free survivorship than those who underwent combined ACLR + ALLR with HT autografts.

However, the aforementioned studies included mainly young and active populations. To our knowledge, ours is the first study that reports comparative clinical outcomes of combined ACLR and LEAP versus isolated ACLR at long-term follow-up in patients aged >30 years, even though 30% of ACLR procedures are performed on individuals >30 years of age.[20] We believe that the lack of studies in older populations could lead surgeons to reserve LEAPs for young and active individuals, considering age as a criterion to perform lateral tenodesis. In fact, in 2017, the Anterolateral Ligament Expert Group considered age <25 years a secondary criterion for an increased risk of secondary ACL rupture or postoperative residual pivot shift, and they postulated that a combined ACLR + ALLR must be considered for such patients.[40] A recent review by Nazzal et al[27] underlined the fact that LEAP should be performed in patients aged <25 years. In an editorial commentary published in 2023, Servant[36] emphasized that LEAP may be reserved for high-risk patients, especially those who are young (14-25 years old) and active in pivoting sports. According to the Latin American Formal Consensus, LEAPs in primary ACLR are appropriate for patients <25 years who have high-grade physical examination findings, practice a pivoting sport, and have hyperlaxity.[1] In a multicenter randomized clinical trial published in 2022, Firth et al[9] concluded that the addition of lateral extra-articular tenodesis to hamstring autograft ACLR was associated with 60% lower odds of graft rupture and a 46% rate of postoperative asymmetric pivot shift, but only patients between the ages of 15 and 25 years were recruited for the study. In contrast, the importance of the current study is the demonstration that ACLR has better results in terms of graft failure rate when combined with LEAP, even in patients >30 years.

An important finding of this study was that younger age (between 30 and 35 years) was also a significant risk factor for graft ruptures in multivariate analysis. This is not an unexpected finding because many previous studies have reported age to be an important risk factor for graft failure and a predictor for early revision ACLR.[9,19,23,24,33,35,38] These findings could be explained by the fact that younger patients may be more physically active and more likely to participate in pivoting sports than older patients. This may have contributed to the higher graft failure rate in patients between 30 and 35 years of age in this study.

Our study demonstrated that patients with ACLR + LEAP experienced a lower rate of secondary meniscectomy than patients with isolated ACLR (2.2% vs 5.6%, respectively; $P = .0031$). These findings are consistent with previous studies demonstrating that combined ACLR and ALLR were associated with a significantly lower rate of failure of medial meniscal repairs when compared with those performed at the time of isolated ACLR.[12,46] More recently, Laboudie et al[21] demonstrated that compared with ACLR alone, combined ACLR + ALLR reduced the rate of graft failure and secondary meniscal injury in young athletes. This may be explained by the fact that injury to the anterolateral structures has been shown to be the most important risk factor for a grade 3 pivot shift; adding an ALLR during ACLR provides additional rotational stability that promotes meniscal stability and healing of meniscal tears.[7]

As already known from the literature, extra-articular tenodesis is a safe procedure, especially with recent techniques. In a large series of 548 patients, Thaunat et al[48] reported that ALLR-specific complications occurred in 1% of patients. In addition, a prospective randomized study from the SANTI Study Group did not demonstrate any increased risk of reoperations or complications when ACLR + ALLR was performed compared with when an isolated ACLR with BPTB graft was performed.[45] In a randomized clinical trial, the Stability Study Group found a low complication rate at the 2-year follow-up in patients who underwent ACLR plus the modified Lemaire procedure, and most complications were related to hardware irritation that necessitated staple removal.[13] Our study is in line with the literature, and no specific complications related to ALLR were identified.

The major limitation of the current study is its retrospective and nonrandomized design. Propensity score matching was used in an attempt to minimize bias, but certain factors not accounted for in the matching process, such as the magnitude of the pivot shift and generalized ligamentous laxity, could potentially introduce further bias. Patients undergoing isolated ACLR had a longer time between surgery and final follow-up. However, a Cox analysis was performed to address this difference. Another limitation is the single-center design of our study, where all procedures were performed by the same surgeon. All available data were included, and so an a priori sample size calculation was not performed; potentially, our study could be underpowered despite the large study population. Furthermore, this study included only Lemaire or ALL procedures, without considering other types of LEAPs. Nevertheless, in the existing literature, no significant differences have been reported between different anterolateral procedures.[17,28,29] In addition, because of the design of the study, patient-reported outcomes, which could provide useful insight into the effectiveness and patient perceptions of treatment, were not reported. Because of the retrospective design, we were unable to reliably determine the timing and rate of return to preinjury activity levels or the effect of aging and changes in patients' individual life circumstances on activity levels at final follow-up. Therefore, analyses of the association between activity level and graft rupture were based on the preinjury activity.

Another limitation of our study is the lack of evaluation of the potential risk of osteoarthritis in the 2 groups of

patients. Concerns have been raised about the possibility of an increased risk of osteoarthritis with the addition of a LEAP. However, recent research has shown that the combination of ACLR and ALLR—the predominant LEAP procedure in our study population—did not increase the risk of osteoarthritis at midterm follow-up.[37] In addition, not all patients included in our study underwent systematic evaluation with return-to-sport tests. Nevertheless, recent studies have shown that the addition of an ALLR during ACLR does not delay functional recovery compared with isolated ACLR.[5] Finally, the comparison involved 2 groups with a notable difference in the time from injury to reconstruction, which was longer in the combined procedure group. This longer time interval may contribute to a higher incidence of meniscal and chondral injuries.[2]

CONCLUSION

Patients aged >30 years who underwent combined ACLR and LEAP experienced a >3-fold lower risk of ACL graft failure than those who underwent isolated ACLR. Furthermore, the group without LEAP experienced a higher rate of secondary meniscectomy.

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