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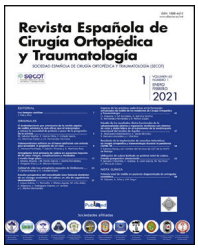

ORIGINAL ARTICLE

[Translated article] Lateral extra-articular tenodesis in association to all-inside anterior cruciate ligament reconstruction does not modify return to play in basketball players: A comparative cohort study

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KEYWORDS
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Lemaire;
Re-rupture

Abstract
Introduction: Return to play rates after anterior cruciate ligament (ACL) reconstruction range between 50-98% depending on sport professionality, without being modified by the addition of an extra-articular augmentation (EA). The objective of the study is to describe the rate of return to play in our cohort. The hypothesis is that the addition of EA increases that rate.
Material and methods: A retrospective, descriptive and analytical study of a 130 basketball players cohort between 18 and 45 years old, whom underwent ACL reconstruction between the years 2018 and 2022, with a minimum follow-up of 18 months. Data was collected by reviewing medical records. IKDC score was registered after one year from surgery. All patients operated from 2020 received an extra-articular tenodesis.
Results: Of all patients, 72.31% returned to training, 70.77% returned to competition and 46.15%returned to the same level of performance prior to injury. The EA group (46.15%) did not increase the rate of return to competition ($P = .552$) nor to the same level of performance ($P = .664$). The mean IKDC. score was 86.83 (SD 14.85), and was not higher in the EA group ($P = .418$). However, its value was higher in the players who returned to training, competition and level of performance($P < .05$). EA did not delay the return to play in any group ($P = .282$).
Conclusion: To sum up, the EA does not modify the return to sport rate. Higher IKDC values predict a greater return to sport rate in all groups. Prospective studies with larger sample size and longer follow-up time are required.

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PALABRAS CLAVE
LCA;
Vuelta al deporte;
Aumentación extra-articular;
Tenodesis extra-articular lateral;
Lemaire;
Re-rotura

La aumentación con tenodesis extraarticular de la reconstrucción del ligamento cruzado anterior asociado a la técnica «all-inside» no modifica la vuelta al deporte en jugadores de baloncesto federados: estudio de cohortes comparativo

Resumen
Introducción: Las tasas de vuelta al deporte tras la reconstrucción del ligamento cruzado anterior (LCA) oscilan entre un 50-98% en función de la profesionalidad, sin verse modificadas de forma significativa por la adición de una aumentación extraarticular (AE), pero sí disminuye las rerroturas. El objetivo del estudio es describir la tasa de vuelta al deporte en nuestra cohorte y demostrar que la AE no la modifica.
Material y métodos: Estudio retrospectivo, descriptivo y analítico de una cohorte de 130 jugadores de baloncesto federado entre 18 y 45 años, intervenidos entre 2018 y 2022, con seguimiento mínimo de 18 meses. Los datos fueron obtenidos mediante revisión de historias clínica y registro del IKDC al año. A partir de 2020, a todos se les añadió una tenodesis extraarticular.
Resultados: Un 72,31% volvió a los entrenamientos, un 70,77% a jugar partido oficial y un 46,15% al mismo rendimiento previo a la lesión. La AE (46,15%) no aumentó la tasa de vuelta a partidos (p = 0,552) ni al mismo rendimiento (p = 0,664). El IKDC medio fue de 86,83 (DE: 14,85) y no fue mayor en el grupo de AE (p = 0,418), en cambio, el valor sí fue mayor en los jugadores que volvieron a los entrenamientos, partidos y rendimiento (p < 0,05). La AE no retrasó la vuelta al deporte en ningún grupo (p = 0,282).
Conclusiones: La AE no modifica la tasa de vuelta al deporte en nuestro estudio. Valores mayores del IKDC sí predicen un mayor retorno al deporte. Estudios con mayor tamaño muestral, prospectivos y de más tiempo de seguimiento son necesarios.

Introduction

The anterior cruciate ligament (ACL) is one of the most frequently injured structures of the knee. It is estimated that in the USA alone, the annual incidence of ACL rupture could be as high as 200,000.[1] In Spain, it has been estimated that in 2014, 30% of all knee arthroscopies performed were ACL reconstructions (10,120 surgeries), increasing by 8% with respect to 2001.[2] The risk of suffering an ACL injury is greater for young athletes, particularly females, who engage in sports that involve pivoting.

Surgical reconstruction of the ACL in individuals between 18 and 35 years of age has been shown to prevent episodes of instability, joint laxity, and injury to other joint structures, with subsequent development of osteoarthritis.[1,3] Despite the fact that it is a standardised technique, reconstruction fails in 4–18% of all cases.[4,5] Furthermore, most patients do not return to practice and suffer persistent rotational instability (25–30%).[6,7] There are a number of techniques for ACL reconstruction; specifically, while the all-inside technique with cortical fixation in the tibia and femur has not proven to be superior to others in terms of functional results or re-ruptures, it does allow larger diameter plasties to be used and there is less widening of the tibial tunnel compared to fixation with an interference screw.[8]

The failure of the plasty and persistent patellar instability rates have prompted the use of extra-articular augmentation (EA) procedures, such as lateral extra-articular tenodesis (LET) or anterolateral ligament reconstruction. In young patients with a high degree of rotational instability and who play sports that involve pivoting, these techniques can significantly reduce plasty failure rates. In the STABILITY study, in which ACL reconstruction alone was compared to the same surgery plus a 4% LET in ACL + LET (relative risk reduction [RRR]: 0.67; 95% CI: 0.36–0.83; $p < 0.001$); similarly, a clinical failure of the plasty (rotational instability or rupture of the plasty) was observed in 40% of the ACL group vs. 25% in the ACL + LET group (RRR: 0.38; 95% CI: 0.21–0.52; $p \leq 0.0001$). Likewise, in a prospective study of 502 subjects, Sonnery Cotet et al. compared ACL reconstruction with bone-tendon-bone (BTB) plasty vs. hamstrings vs. hamstrings + LET and noted a failure rate of 10.77% for hamstrings, 16.77% for BTB, and 4.13% for hamstrings + LET, with the risk of failure being 2.5 times less in hamstrings + LET in comparison with BTB (hazard ratio [HR]: 0.393; 95% CI: 0.153–0.953) and 3.1 times lower than with hamstrings (HR: 0.327; 95% CI: 0.130–0.758).[9,10] Furthermore, EA is suspected of being capable of improving return to sport rates, although the evidence currently available is insufficient to demonstrate this.[11] In some series, between 63 and 98% of elite athletes returned to sport, with only 59% reaching the same level,[12] while in other series of recreational athletes, only 50–62% return to sport after 4–5 years. One year postoperative, some series have reported that only 64–67% return to play.[14]

The hypothesis put forward in the study is that the association of LET with all-inside ACL reconstruction does not impair the patient's ability to return to sport, as has been reported in the literature, with some studies even finding higher rates of return in cases that have undergone LET.[9–11]

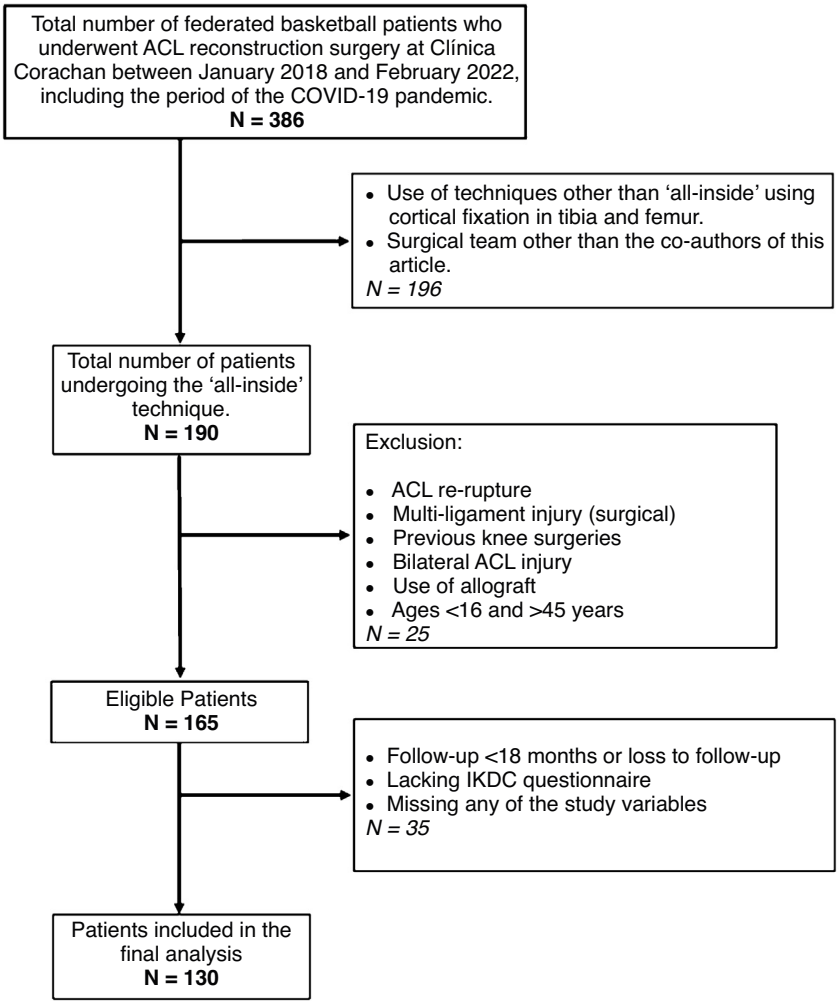

Figure 1 Flow chart of patients included in the study: anterior cruciate ligament (ACL), International Knee Documentation Committee (IKDC).

Accordingly, the objective is to prove this hypothesis and describe return rate by comparing a cohort of federated basketball players with an ACL tear treated with an Arthrex® all-inside reconstruction, either with or without an LET.

Methods

The current work was previously approved by the corresponding ethics committee (HCB/2022/0944). This is a retrospective cohort study (level of evidence III) of patients who underwent surgery between January 2018 and February 2022, in accordance with STROBE criteria. All subjects were operated on surgery at a single, private centre by five surgeons and coauthors of the manuscript with ample experience managing ACL injuries. A minimum postoperative follow-up time of 18 months was contemplated. All federated basketball players between 16 and 45 years of age with an ACL injury that was reconstructed using an all-inside technique, with or without an associated LET. Subjects were excluded if they had a surgery history in the same knee, bilateral injuries, injuries involving multiple ligaments, as well as those in whom physeal-sparing technique had been carried out. An initial total sample was obtained consisting of 386 patients who had undergone surgery at our hospital by different surgical teams, including the COVID-19 pandemic period. Finally, after application of the exclusion criteria set down, there was a total of 130 (flow diagram, Fig. 1).

The data recorded comprised patients' baseline characteristics and sports practice, psychosocial data, the mechanism of injury, physical examination, injury characteristics, treatment, and post-surgical follow-up and complications. The number one outcome was defined as return-to-play, divided by time until: return to training, return to official play, and return to pre-injury competitive performance.

The data were gathered from the clinical records available on Gescora software support (Clínica Corachán, Spain) and integrated into a coded database in Microsoft Excel®. XERO® Viewer software (Agfa Healthcare, Belgium) was used to evaluate the radiological images. Patient Reported Outcomes (PROM) were measured using the International Knee Documentation Committee (IKDC) scale, which is routinely performed one year following surgery, just as physical examination is also systematically carried out one year

after surgery. This scale was chosen because it was initially designed to evaluate knee ligament injuries and because it covers three key dimensions in a single test (symptoms, sport and daily activity, and current and previous knee function); in addition, it has been validated and translated into Spanish and approved by the ESSKA.

Statistical analysis

Statistical analyses were conducted with the STATA® IC/15.1 statistical programme (StataCorp LLC, College Station, Texas, USA). First, a purely descriptive analysis of our sample was conducted with the usual parameters. Afterwards, it was assumed that the sample would follow a normal distribution pattern, and parametric analyses were performed for comparative purposes (Chi-square and Student's *t*-test). The results that yielded a *p*-value of <0.05 were deemed to be statistically significant.

Rehabilitation

Prior to surgery, all patients completed a pre-established 2–4-week rehabilitation protocol that sought to recover an adequate degree of knee function, which entailed complete recovery of joint balance, reduction of joint effusion, treatment of any possible bone oedema, as well as strengthening primarily of the quadriceps and hamstring muscles. The interval between the injury and surgery was planned to be at least 3–4 weeks in order to be able to complete this prescribed rehabilitation protocol (although it was possible to extend this period in several cases, mostly due to work or study reasons).

Insofar as the postoperative rehabilitation protocol is concerned, after 4–6 weeks, the foremost objectives were: to obtain a minimum joint balance of 0–90° (especially full extension); ambulation without the use of aids; gait re-education; proprioception and muscle tone work, and to start work in the swimming pool. After three months, the protocol called for stability testing (*Lachmann*), full balance, beginning of bicycle work, and isokinetic concentric and eccentric strength training. At 4–5 months, subjects began continuous running in a gradual manner. At six months, adequate muscle tone compared to the contralateral leg and knee stability were checked (*Pivot Shift and Lachmann*) before readaptation to practicing sport could be authorised.

Surgical technique

The surgical technique of choice used was ACL reconstruction using an autologous quadruplicate semitendinosus graft following the ''all-inside'' technique with adjustable suspension system (*TightRope RT* – Arthrex®) (Fig. 2). All patients received an AE performed with the modified Lemaire technique (Fig. 3) starting in the year 2020. Prior to this, the extensive use of extra-articular reinforcement had not been protocolized. In the case of meniscal lesions, treatment by suture was preferred whenever possible, thereby minimising the need for meniscectomy.

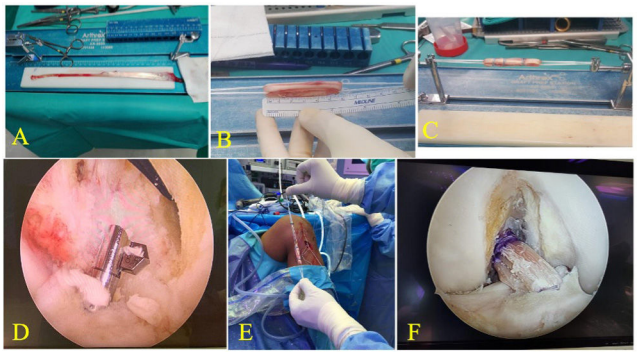

Figure 2 Surgical images of ACL reconstruction using the All-Inside technique: (A) Harvesting of the autologous semitendinosus (ST) muscle tendon graft, after cleaning, and then preparing the plasty according to the standard technique. A minimum length of 24 centimetres must be obtain before being quadruplicated. (B) Quadruplicated ST plasty measuring 6 cm in length. (C) Quadrupled ST plasty and stretched at 10–15 N for 10 min. (D) Intraoperative detail of the retrograde reaming of the tibial shaft with the *FlipCutter* retrograde reaming system (Arthrex®), in this case, 8.5 mm in diameter. (E) Plasty prepared with the *TightRope*-RT cortical suspensory systems, Arthrex®. (F) Arthroscopic image of the attached plasty.

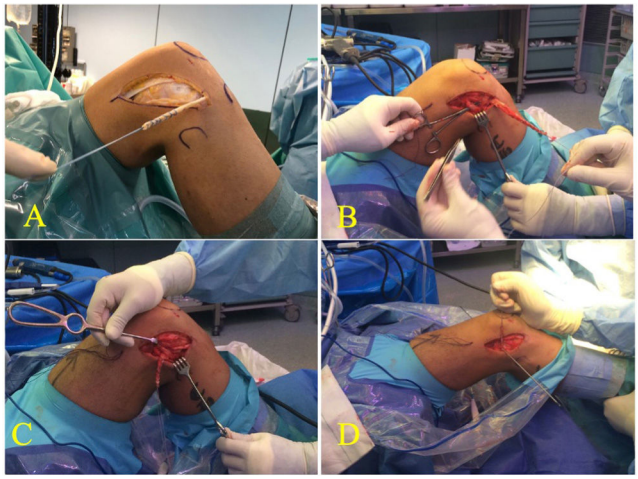

Figure 3 Surgical images of extra-articular augmentation by means of extra-articular tenodesis following the modified Lemaire technique: (A) Image in which the incision made in the lateral aspect of the knee can be seen, taking the lateral epicondyle, Gerdy's tubercle and fibular head as references. A 1 cm wide and 8–10 cm long plasty of the middle-posterior third of the iliotibial band is obtained, leaving its distal insertion intact. Proximally, traction sutures are made using high-strength thread (*FiberLoop*, Arthrex®). (B) Identification of the external lateral ligament (ELL). (C) Reinforcement plasty passed deep to the ELL. (D) Identification of the femoral tunnel entry point where the reinforcement will be secured. Verification of the proper isometry is performed. Subsequently, it is anchored by means of an interference screw.

Table 1 Demographic data.

	Frequency	Patients without LET ($n = 70$)	Patients with LET ($n = 60$)	p-Value
Sex				
Males	65	40	25	
Females	65	30	35	0.079
Age (years)	20.9	21.79	20.58	0.259
BMI	22.7	23.01	22.0	0.3952
Time to surgery (days)	124	123.13	126.73	0.8977
Employment status				
Student	96	52	44	
Working	34	18	16	0.902
Position				
Point guard	45	29	16	
Small forward	39	17	22	0.315
Power forward	20	9	11	
Centre	14	7	7	
Shooting guard	12	7	5	
Mechanism of injury				
Direct	25	14	11	
Indirect	105	56	49	0.810
Timing of injury				
Training	39	20	19	
Official match	91	50	41	0.701
Meniscal injury				
No (patients)	66	39	27	
Yes (patients)	64	31	33	0.223
Meniscus involved				
Total injuries	75			
Internal meniscus	29	14	15	
External meniscus	24	12	12	
Both	11 *(11MI + 11ME)*	5 *(5MI + 5ME)*	6 *(6MI + 6ME)*	
Chondral injury				
Yes	4	2	2	
No	126	68	58	0.875
Plasty diameter (mm)	8.26	8.25	8.27	0.8537

BMI: body mass index; LET: lateral extra-articular tenodesis.

Results

As for the demographic data, a summary of the patients' baseline characteristics can be found in Table 1. Likewise, it presents a comparative analysis between the group of subjects that received extra-articular reinforcement ($n = 60$) and those that did not ($n = 70$), revealing that both groups are mutually comparable. The mean follow-up time was two years. In all the patients that underwent surgery, ACL reconstruction was performed by means of a semitendinosus autograft following the ''all-inside'' technique. Of the four cases in which a chondral lesion was found, three were treated by regularizing the lesion and one by microfracture. We obtained a total of 75 meniscal injuries in 64 patients, 40 of the internal menisci, and 35 of the external meniscus (11 individuals with injuries to both menisci). The most common injury was a radial tear of the posterior horn (27 patients) followed by a radial tear of the body (13 subjects). There were four posterior meniscal root injuries (all re-attached by means of tibial tunnelling with retrograde reaming using the FlipCutter Arthrex® system and tibial fixation using a suspension button) and seven bucket-handle tears, three of which were treated by meniscectomy and four were repaired using sutures. The mean number of hours of training per week was 5.23 h/week (SD 2.25), with a maximum of 18 and a minimum of 2 h per week. Data regarding pre- and post-surgical physical examination at 1 year are specified in Table 2. The only findings of note were a residual pivot shift in 12 patients (9.23%) and a residual positive Lachmann's in eight patients (6.15%). As for joint balance one year after surgery, we achieved a mean extension score of 0.62° (SD: 2.16) and flexion score of 124.53° (SD: 8.66).

Of all the people who underwent surgery, 72.31% returned to training with the team they had previously been

Table 2 Pre- and post-surgical physical examination.

	Pre-surgical		Post-surgical	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Lachmann				
0	0	0	122	93.85
1	73	56.15	7	5.38
2	53	40.77	1	0.77
3	4	3.07	0	0
Posterior drawer				
Negative	122	93.85	130	100
Positive	8	6.15	0	0
Pivot shift				
0	34	26.15	118	90.77
1	75	57.69	11	8.46
2	16	12.31	1	0.77
3	5	3.85	0	0

playing with; 70.77% returned to play in official matches, and only 46.15% of the patients reported having returned to play at the same level of performance as they had prior to the injury. When examining the relationship between the use of EC or not and the return to competitive sport, no significant differences were found either in the return to competitive sport ($p = 0.552$) or in the return to the same level of performance as before the injury ($p = 0.644$). Likewise, no differences were detected between the presence of meniscal injury or not with the return to competitive play ($p = 0.075$) or the return to the same level of performance ($p = 0.265$). The mean time to return to training was 9.95 months (SD: 4.37) and to return to official match play, 12.42 months (SD 5.88), with a maximum of 48 months to resume playing. When analysing the time it took patients to return to competition in an official match, we found that those who had EC added took an average of 11.7 months, while those who did not, took 13.08 months. Despite observing a trend towards a shorter time to return to competitive play among those individuals with extra-articular tenodesis, the difference was not statistically significant ($p = 0.282$). Similarly, there was no significant difference of the time to return to competition based on the presence or absence of meniscal injury ($p = 0.924$). The main reason for not resuming official matches was the fear of suffering a new injury (34.21%), despite the fact that prior to surgery, patients were asked if they were psychologically prepared to face the entire process, and 80.77% were willing to do so.

One of the most frequent early complications reported were joint effusions during the immediate postoperative period (26.92%), all of which were resolved by simple arthrocentesis and had no effect whatsoever on the person's return to play. There were 10 cases of arthrofibrosis (7.69%), two of which were remedied with rehabilitation; three required closed arthrolysis, and five required arthroscopic arthrolysis. In all of the cases of arthrofibrosis, the athlete's return to sport was delayed; nevertheless, it did not impede his or her return to play. As regards late complications, there was a 3.85% rate of graft failure (5 patients) and a 6.15% rate of injury to the contralateral ACL. All five of the subjects who suffered graft rupture were female, and all did not have the LET associated with the graft. As an aside, one patient underwent biopsy due to recurrent effusions beyond six months and was diagnosed with having pigmented villonodular synovitis. The rates of return to play are detailed together with complications in Table 3.

With respect to the subjective assessment of functionality of the knee, the mean IKDC scale score one year after surgery was 86.83 (SD: 14.85); the lowest score was 20 and the highest score was 100. All the patients treated with LET were found to have a mean IKDC scale of 85.63, whereas in the group without LET, it was 87.84; the difference was not statistically significant ($p = 0.418$). Similarly, no differences in the IKDC values were observed in the case of patients with or without a meniscal lesion ($p = 0.563$). That being said, we did find that individuals who returned to training, to competing in an official match, and to competition at the same level of performance, scored higher on the IKDC in all three groups and the differences were statistically significant ($p < 0.05$).

When the series was divided the study population into those who were over and under 25 years of age; there were no differences when the rate of return to play was compared, nor were there significant differences by sex, with the exception of return to previous levels of performance, in which there was a higher proportion in women ($p < 0.05$).

Discussion

In our cohort of patients, the final rate of return to competitive sports play was 70.77%, and a 46.15% rate of return to the same level of performance as prior to being injured. It is worth pointing out that our study population consisted of federated basketball players, although they did not play at the elite level of competition. The literature reports on the resumption of sports activity in a number of series of athletes, with highly heterogeneous results among all of them because of the differences in the type of sport and, above all, the level of competition (recreational sport, sport as a form of employment, differences from one league to

Table 3 Return to sport and complications.

	Frequency *(no LET/LET)*	Percentage
Return to training		
No	36 (21/15)	27.69
Yes	94 (49/45)	72.31
Return to play in an official match		
No	38 (22/16)	29.23
Yes	92 (48/44)	70.77
Return to the same level of performance		
No	70 (39/31)	53.85
Yes	60 (31/29)	46.15
Reasons for not returning to official play		
Fear of re-injury	13 (8/5)	34.21
Others	9 (4/5)	23.68
Studies	4 (2/2)	10.52
Work	4 (1/3)	10.52
Re-intervention	4 (3/1)	10.52
Pain	3 (3/0)	7.89
Instability	1 (1/0)	2.63
Early complications (<6 months)		
None	78	60
Perioperative effusion	35 (15/20)	26.92
Arthrofibrosis	10 (6/4)	7.69
Others	5 (2/3)	3.85
Impingement	2 (1/1)	1.54
Septic arthritis	0	0
Late complications (>6 months)		
None	92	70.77
Pain	12 (8/4)	9.23
Lack of full extension	8 (4/4)	6.15
Instability	8 (8/0)	6.15
Plasty failure	5 (5/0)	3.85
Contralateral LCA injury	2 (2/0)	1.54
Others	2 (1/1)	1.54
Meniscal injury	1 (1/0)	0.77

ACL: anterior cruciate ligament; LET: lateral extra-articular tenodesis.

another, etc.). For instance, in the study conducted by Hopper et al. of elite athletes from different disciplines, the authors found that the return to play sport (regarded as resuming play in an official match) was 94.7%,[15] similar to the 96.1% reported by Balendra et al. in their cohort of professional soccer players, with 90.1% achieving the same initial value on the Tegner questionnaire following surgery.[12] In a systematic review and meta-analysis of elite athletes, Lai et al. found an average return to performance sport of 83% and a time to play of between 6 and 13 months,[16] similar to that observed in our study (mean of 12.42 months). In their systemic review, Ardern et al. that, among professional and non-professional athletes, the rate of return to play was 79% and 60%, respectively ($p < 0.001$); similarly the percentages of subjects who achieved the same level of performance, were 81% for professional athletes vs. 42% in non-professionals ($p < 0.001$).[17] In a non-professional population, Randsborg et al. reported that 69% returned to play, just as Patel et al. reported a rate of 56.4%[13]; the reasons for not resuming play were fear of new injury[13,18] and change of lifestyle.[18] These findings are similar to those of our series, which thereby corroborates that return rates are lower among non-professional athletes. There may be factors beyond the objective results after surgery, such as better-established rehabilitation protocols, work situation, or psychosocial aspects.

But what does it mean to return to sport? This is a matter of debate and, as articulated in the study by Meredith et al. (Panther Symposium ACL Injury Return to Sport Consensus Group), the terms ''*return to play*'', ''*return to sport*'', ''*return to participation*'', and ''*return to unrestricted physical activity*'', are all used in the literature interchangeably, resulting in confusion.[19] It is also necessary to bear in mind that the term ''*return to sport*'' should be viewed as a continuum (Fig. 4) that involves a number of phases, from the first day of surgery all the way to achieving the same level of performance as prior to the injury, all by means of pre-established rehabilitation protocols. Thus contemplated, achieving a successful return to sport must be measured in terms of the type of sport practised, the intensity, frequency, as well as the level of play.[19,20] Not long ago, the University of Pittsburgh (Panther Symposium ACL Injury Return to Sport Consensus Group) summarised the current state of the art concerning return to sport after ACL injury, by concluding that: (1) Return to sport should not be based on the time elapsed since surgery; (2) Objective data regarding physical examination and validated tests for the evaluation of return to sport, including functional assessments and adequate psychological preparation, must be taken into account, and (3) Biological healing, concomitant injuries, and contextual and social factors ought also to be factored in. Nevertheless, prospective and randomised studies to substantiate this information are still required.[19,21]

Another area for discussion has to do with how to evaluate whether or not the patient is ready to return to sport both objectively and subjectively (*Patients Reported Outcomes* [PROMs]). At present there is a wide variety of subjective scales available to quantify knee function, the most commonly used of which include the IKDC, KOOS, *Lysholm Knee Scoring Scale*, WOMAC, and the *Tegner Activity Score*.[22,23] We used the IKDC in our study because we believe that it is a comprehensive questionnaire that is highly suitable for ACL reconstructive surgery, in addition to the fact that it correlates closely with other scales, such as the *Cincinnati Knee Rating System* (CKRS), which has also been validated for this surgery.[22,23] In line with other studies,[13,25] Edwards et al. have demonstrated that individuals having an IKDC of more than one year were more likely to return to sport.[24] In contrast, Ardern et al. found no difference between IKDC and return to sport.[14] Notably, in our series, the IKDC scale scores were significantly higher among those athletes in all three groups analysed who did, in fact, return to sports activity (training, matches, performance). To date, there is only one scale, namely the *Knee Santy Athletic Return To Sport* (K-STARTS) developed in 2015, that has been validated as a suitable objective measure that comprises eight components analysed in seven tests to determine the optimal time to resume practising sport,[26,27] and it should be both considered, as well as used.

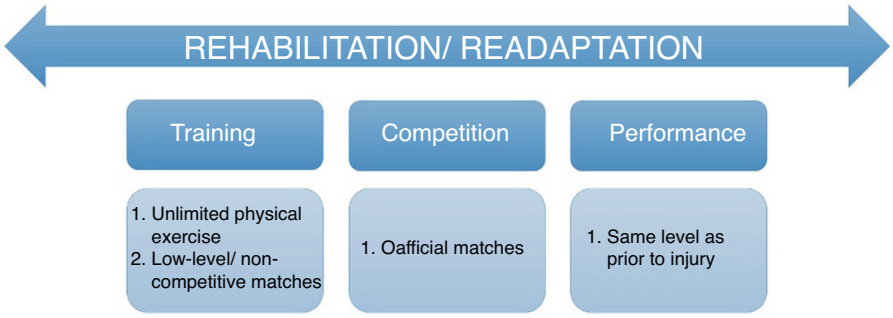

Figure 4 Return to continuous sport[19]: Returning to sport is viewed as a continuous process starting at the time of surgery and that involves distinct phases. The first is ''*return to participation*'', which is defined as the start of unrestricted training or participation in sport at a mild level of intensity. The second, ''*return to sport*'', is understood as returning to the same level of sport, albeit not the same level of performance. Finally, the third phase, ''*return to performance*'', consists of performing at the same level as prior to the injury.

In our study, the use of EC showed no greater return to sport in the three groups under study, albeit there was a trend towards a shorter time to return to play in the EC group; nonetheless, this difference failed to attain a level of statistical significance. There are now numerous randomised, prospective, long-term studies that point to EC actually decreasing re-rupture rates.[7,9–11] In fact, in the five cases of graft failure in our series, none had received EC; these data endorse its use to lower the rate of failures. It is worth noting that in our study, there 9.23% of the subjects had residual rotational instability, in line with the rates reported in the literature, and that 11 of the 12 patients with a positive pivot shift one year following surgery did not have an EC plasty, indicating that the addition of EC may be beneficial in our cohort. As far as return to play is concerned, in their systematic review of ACL reconstruction with or without EA, Hurley et al. found a high rate of return to play in all the 19 studies included, regardless of the technique used (82–100%); however, none of the five studies comparing ACL vs. ACL and EC detected statistically significant differences in overall return-to-sport rates. They only found significant differences in two of six studies specifically comparing ACL vs. ACL and EC and return to sport at the same level or higher that their pre-injury degree.[28] Another controversy surrounds the issue of whether adding augmentation can slow down the entire rehabilitation process and delay return to sport. In their randomised clinical trial (STABILITY study), Getgood et al. reported a slight slowing of one month in the ACL plus EA group,[10] in contrast to Zaffagnini et al. who found that the EA group returned sooner to sport.[29] Finally, Coquard et al. observed that six months after surgery there were no significant differences with respect to either the Tegner scale or the K-STARTS (validated return to sport fitness test) between ACL vs. ACL plus EA, confirming that the use of extra-articular plasty posed nodisadvantage,[30] analogous to the results of our study. All this begs the question that systematically adding EA when using the hamstrings as a plasty may constitute a good option to lower the rates of persistent rotational instability, in addition to re-ruptures, while not altering the person's return to sport.

Finally, as for predictive factors for return to play, the presence of meniscal injuries, chondral injuries, internal lateral ligament injuries, age > 25 years, female sex, psychosocial factors, and poor prior activity levels are predictors of a decreased return to sport.[12,13,18,24] Webster et al. even documented that the most significant predictor of successfully resuming the same level of performance was appropriate psychological preparation to cope with the rehabilitation process.[25]

One of the limitations of the study is its retrospective and descriptive nature, which has the potential to limit the ability to derive causal relationships between the addition of EA and the rate of return to sport. The modest sample size and the specific population in question may similarly preclude drawing definitive conclusions and extrapolating the results to other sport populations. The average follow-up time of two years might also be viewed as a major limitation to being in a position to explore long-term return-to-sport rates, as well as final stability and secondary injury rates. Another limitation that we deem highly relevant in this study and that might be a decisive confounding factor is the presence of the COVID-19 pandemic starting in March 2020, during which all sporting activities were completely suspended and gradually resumed at the end of the year. Moreover, in terms of rehabilitation, it could be that the usual working methodology was modified as a consequence of COVID, although it is also true that at the time when surgery was resumed on patients, the restrictions were much less severe. All this could have resulted in a delay in the return to sport and may have even led to some patients who would have returned to sport not doing so in the end.

Conclusions

EA when performed using the modified Lemaire technique does not yield a higher rate of return to competitive sport, nor does it result in a return to pre-injury performance in our series of patients. On the other hand, whether or not a lateral extra-articular tenodesis was incorporated and its correlation with the time to return to sport, no significant differences were detected, albeit there was a tendency towards sooner return to sport in the EA group. IKDC scale scores are higher among patients who resume training, to official competition, and to pre-injury performance level, irrespective of the technique performed.

Level of evidence

Level of evidence III.

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Conflict of interests

The authors have no conflict of interest with Arthrex.

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