

World Journal of *Orthopedics*

World J Orthop 2022 September 18; 13(9): 777-875



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INDEXING/ABSTRACTING

WJO is now abstracted and indexed in PubMed, PubMed Central, Emerging Sources Citation Index (Web of Science), Scopus, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2022 edition of Journal Citation Reports® cites the 2021 Journal Citation Indicator (JCI) for WJO as 0.62. The WJO's CiteScore for 2021 is 2.4 and Scopus CiteScore rank 2021: Orthopedics and Sports Medicine is 139/284.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Ying-Yi Yuan*, Production Department Director: *Xiang Li*, Editorial Office Director: *Jin-Lai Wang*.

NAME OF JOURNAL

World Journal of Orthopedics

ISSN

ISSN 2218-5836 (online)

LAUNCH DATE

November 18, 2010

FREQUENCY

Monthly

EDITORS-IN-CHIEF

Massimiliano Leigheb

EDITORIAL BOARD MEMBERS

<http://www.wjgnet.com/2218-5836/editorialboard.htm>

PUBLICATION DATE

September 18, 2022

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INSTRUCTIONS TO AUTHORS

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<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>



Observational Study

Revision anterior cruciate ligament reconstruction: Return to sports at a minimum 5-year follow-up

Ezequiel Ortiz, Juan Pablo Zicaro, Ignacio Garcia Mansilla, Carlos Yacuzzi, Matias Costa-Paz

Specialty type: Orthopedics

Provenance and peer review:

Invited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's scientific quality classification

Grade A (Excellent): 0
Grade B (Very good): 0
Grade C (Good): C, C
Grade D (Fair): 0
Grade E (Poor): 0

P-Reviewer: Ozden F, Turkey;
Zeng Y, China

Received: December 28, 2021

Peer-review started: January 4, 2022

First decision: February 21, 2022

Revised: May 4, 2022

Accepted: August 10, 2022

Article in press: August 10, 2022

Published online: September 18, 2022



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Abstract

BACKGROUND

Between 43% and 75% of patients who undergo primary anterior cruciate ligament (ACL) surgery return to sport activity. However, after a revision ACL reconstruction (ACLR) the rate of return to sports is variable. A few publications have reported returns to sports incidence between 56% to 100% after revision ACLR.

AIM

To determine return to sports and functional outcomes after a single-stage revision ACLR with a 5-year minimum follow-up at a single institution.

METHODS

All patients operated between 2010 and 2016 with a minimum 5 years of follow-up were included. Type of sport, intensity, frequency, expectation, time to return to sport and failure rate were recorded. Lysholm, Tegner and International Knee Documentation Committee forms were evaluated prior to the first ACLR surgery, at 6 mo after primary surgery and after revision ACLR at 5 years minimum of follow-up. Objective stability was tested with the knee arthrometer test (KT-1000 knee arthrometer, Medmetric Corp).

RESULTS

A total of 41 patients who underwent revision ACLR during that period of time were contacted and available for follow-up. Median patient age at time of revision was 29 years old [interquartile range (IQR): 24.0-36.0], and 39 (95.0%) were male. The median time from revision procedure to follow-up was 70 mo (IQR: 58.0-81.0). Regarding return to sports, 16 (39.0%) were at the same level compared to preinjury period, and 25 patients (61.0%) returned at a lower level. Sixty-three percent categorized the sport as very important and 37.0% as important. One patient (2.4%) failed with a recurrent ACL torn. Mean preoperative Lysholm and

subjective International Knee Documentation Committee scores were 58.8 [standard deviation (SD) 16] and 50 (SD 11), respectively. At follow-up, mean Lysholm and subjective International Knee Documentation Committee scores were 89 (SD 8) and 82 (SD 9) ($P = 0.0001$). Mean Tegner score prior to primary ACLR was 6.7 (SD 1.3), 5.1 (1.5 SD) prior to revision ACLR and 5.6 (1.6 SD) at follow-up ($P = 0.0002$). Overall, knee arthrometer test measurement showed an average of 6 mm (IQR: 4.0-6.0) side-to-side difference of displacement prior to revision ACLR and 3mm (IQR: 1.5-4.0) after revision.

CONCLUSION

Almost 40.0% of patients returned to preinjury sports level and 60.0% to a lower level. These may be useful when counseling a patient regarding sports expectations after a revision ACLR.

Key Words: Return to sport; Revision anterior cruciate ligament; Arthroscopy; Knee; Functional outcome

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Core Tip: This was a retrospective case series with 41 patients seeking to evaluate return to sports and clinical outcomes after revision anterior cruciate ligament reconstruction at 5 years minimum of follow up. Retrospective analyzed data included physical examination, Tegner activity level, Lysholm, International Knee Documentation Committee, type of sport, intensity, frequency, expectation and time to return to sport. Objective stability was tested with the knee arthrometer test. All data were recorded at the base line and after a 5-year minimum follow-up.

Citation: Ortiz E, Zicaro JP, Garcia Mansilla I, Yacuzzi C, Costa-Paz M. Revision anterior cruciate ligament reconstruction: Return to sports at a minimum 5-year follow-up. *World J Orthop* 2022; 13(9): 812-824

URL: <https://www.wjgnet.com/2218-5836/full/v13/i9/812.htm>

DOI: <https://dx.doi.org/10.5312/wjo.v13.i9.812>

INTRODUCTION

Consequent to a substantial increase in the incidence of anterior cruciate ligament (ACL) ruptures, revision ACL reconstruction (ACLR) has also suffered an increase[1]. The ACL re-rupture rate is between 4% to 6%, with the event occurring in the first 2 years in more than half of the cases[2-4]. The rate of one-third of ACL ruptures is around 13% to 19% according to different publications[5-7]. In addition, these patients also present an increased risk of developing early arthritis[8].

Historically, return to sports (RTS) is defined as the return to the pre-injury activity in one or two seasons, at the same sporting level[9]. A recently published consensus described continuous RTS in three stages: return to participation, RTS and return to previous performance. Thus, return to participation refers to the return to training or to a lower sporting level than the one practiced by the patient previously. RTS refers to the return to the sport previously performed, although not at the desired level. Return to previous performance refers to the return to the same level or a higher level than before the injury[10].

Between 43% and 75% of patients who undergo primary ACL surgery RTS[11-15]. However, after a revision ACLR the reported rates of RTS are very variable[16]. Causes of non-RTS are multifactorial and include age, sex, psychological factors, type of sport, number of previous surgeries, time lapse between surgeries and graft choice[11-26]. Few publications report sports return rates after revision ACLR, both in the medium and long term, and they vary from 56% to 100%[27-31]. The purpose of this study was to evaluate the rate of RTS in patients with revision ACLR after 5 years of surgery. The secondary purpose was to report the functional outcomes.

MATERIALS AND METHODS

Study group

This study was approved by the Ethics Committee of our hospital. A retrospective study was performed including all patients who underwent a revision ACLR between 2010 and 2016. The inclusion criteria were patients with traumatic or atraumatic knee instability with a displacement equal to or larger than 5 mm anteroposterior compared to the contralateral knee measured with the KT-1000 arthrometer after primary ACL surgery and older than 18 years.

Patients with multiligament injuries (more than two ligaments injured at the same time), second ACL revision and patients with osteotomies at time of revision ACLR surgery were excluded (Table 1).

Surgical technique

A single stage revision ACLR was performed in the whole series. A diagnostic arthroscopy was performed in every case, and if necessary associated meniscal and cartilage lesions were treated. In 5 patients, allografts were used. The fixation technique was with 2 titanium screws for bone tendon bone, and in cases of hamstrings or anterior tibial allograft; fixation was performed with a cortical button in the femur and a biocomposite interferential screw in the tibia.

Postoperative rehabilitation

All patients entered the same rehabilitation protocol with rearrangements for individual needs. Partial loading was allowed for the first 3 wk. Passive flexion and extension range of motion were carried out. In special cases with complex meniscal sutures or cartilage treatment with mosaicoplasty, full loading was delayed until week 6. From the 4th month onwards, low impact workout exercises and progressive muscle strengthening were started. RTS was allowed after 10 mo depending on the sport practiced prior to the revision ACLR and based on an evaluation by our rehabilitation team.

Evaluation

Assessment was performed by a single evaluator in this study. Age, sex, follow-up time, injury mechanism prior to revision ACLR, time between primary surgery and re-rupture, time between revision ACLR and RTS, technique used in both primary surgery and revision ACLR and associated procedures were recorded.

All patients were asked about the type and level of sport practiced, the motivation to RTS and the expectation of returning to sport in three instances: prior to the first ACL reconstruction surgery, after primary surgery and after revision ACLR and RTS. RTS activity was considered to be the return to their sport prior to the last injury at the same level or below the previous level. Motivation was classified as: very important, important, moderately important, minimally important or not important. The expectation regarding RTS was classified as: return to the same sport level, return to a lower level or not returning to the same sport. The number of sports practices per week before and after the revision ACLR was recorded.

Using the Tegner score, the type of sport was classified into high impact, moderate and low impact, according to the classification published in 2015 by the American Heart Association[32]; high impact was considered those with Tegner greater or equal to 7, moderate impact with Tegner between 4 to 6 and low impact with Tegner between 1 to 3. Lysholm and International Knee Documentation Committee Knee (IKDC) scores were used prior to the revision ACLR and at the last follow-up. For an objective assessment, the KT-1000 arthrometer (Medmetric Corp) was used at the last follow-up.

We defined failure of revision ACLR surgery as ACL re-rupture, whether traumatic or atraumatic, associated with positive pivot shift and a difference in arthrometry with KT-1000 greater than or equal to 5 mm requiring new surgery.

Statistical analysis

Due to the small sample of patients non-sample size calculations were conducted. Continuous variables were described as median and interquartile ranges. Categorical variables were reported as proportions with their absolute frequency. Stata 14 software was used for the analysis. Statistical significance was considered to be $P = 0.05$.

RESULTS

A total of 87 revision ACLR were performed in the study period: 16 were excluded because of multiligamentary lesions, 8 were second revisions, and 10 were associated with osteotomy. Of the 53 patients who met the inclusion criteria, 12 patients were lost during follow-up. The series consisted of 41 patients with a median follow-up of 70 mo (IQR: 58.0-81.0) (Figure 1). Thirty-nine patients were male with a median age of 29 years (IQR: 24.0-36.0). Table 1 shows the demographic data.

Surgical data

A total of 27 (65.8%) patients had concomitant meniscal lesions. The medial meniscus was more frequently injured ($n = 26$); 20 (77.0%) were treated with meniscectomy, 6 (19.0%) with repair and 1 (4.0%) with meniscal transplantation. Lateral meniscus was injured in 14 patients; all were treated with partial meniscectomy. Chondral lesions were found in 5 (12.0%) patients; 3 (60.0%) were treated with microfractures and 2 (40.0%) with chondroplasty (Table 2).

Table 1 Demographics

Demographics	Results (N = 41)
Yr, median (IQR)	29 (24-36)
Male, n (%)	39 (95)
Follow up (mo) (IQR)	70 (58-81)
Period (a)	2010-2016
Injury mechanism prior revision ACLR	
Traumatic	26 (63.4%)
Atraumatic	15 (36.6%)
Time between (mo)	
ACL Primary surgery and retear	22 (22-39)
Revision ACLR and return to sport	13 (11-15)
Failure	1 (2.4%)

IQR: Interquartile range; ACLR: Anterior cruciate ligament reconstruction; ACL: Anterior cruciate ligament.

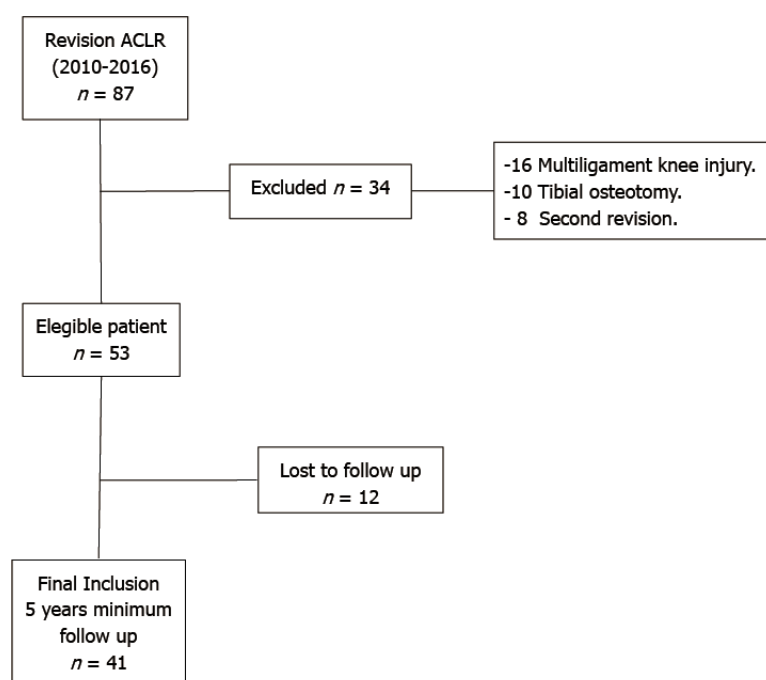
Table 2 Surgical technique and concomitant lesions

Graft	n (%)	Surgical technique	n (%)	Augmentation	n (%)
Primary ACL					
Hamstring	29 (70.7)	Monotunnel	36 (87.0)	-	-
BPTB	11(26.8)	Anatomic	5 (12.0)	-	-
Allograft	1 (2.4)				
Revision ACLR					
Hamstring	10 (24.3)	Anatomic	41 (100)	Lemaire	15 (36.0)
BTB	29 (70.3)			Allograft	2 (4.8)
Allograft	5 (2.0)			No Augmentation	24 (58.0)
Concomitant lesions					
Both meniscus	9 of 41 (21.0)				
Medial meniscus	26 of 41 (66.0)				
Meniscectomy	20 (77.0)				
Meniscal suture	5 (19.0)				
Meniscal transplantation	1 (4.0)				
Lateral meniscus					
Meniscectomy	14 of 41 (34.0)				
Chondral lesions	5 (12.0)				

BTB: Bone tendon bone; ACL: Anterior cruciate ligament; ACLR: Anterior cruciate ligament reconstruction; BPTB: Bone patellar tendon bone.

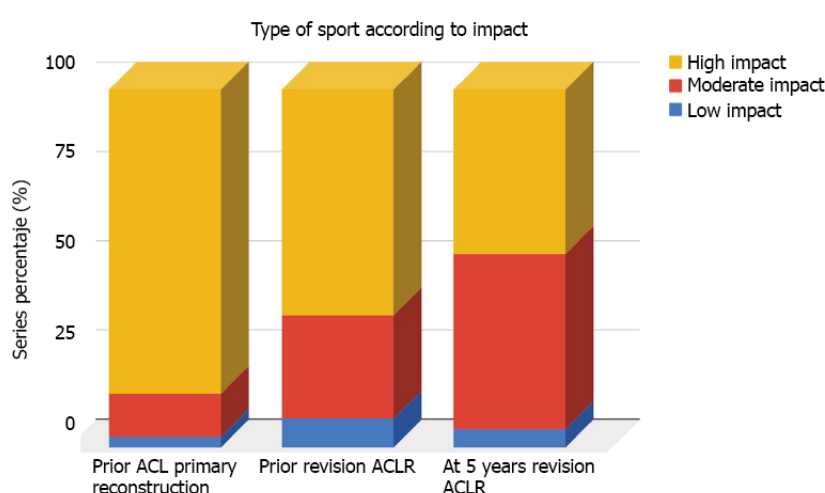
RTS

Prior to the first injury, 35 (85.0%) patients practiced high impact activities, 5 (12.0%) moderate and 1 (3.0%) low impact. After the first ACL surgery, 26 (63.0%) patients practiced high impact, 12 (29.0%) moderate and 3 (8.0%) low impact; 5 years after ACL revision, 19 (46.0%) continued to perform high impact, 20 (49.0%) moderate and 2 (5.0%) low impact (Figure 2). Prior to revision ACLR the patients practiced: soccer (24, 59.0%), running (9, 22.0%), gym (3, 7.0%), rugby (2, 5.0%), tennis (1, 2.0%), cycling (1, 2.0%) and other (1, 2.0%) other.



DOI: 10.5312/wjo.v13.i9.812 Copyright ©The Author(s) 2022.

Figure 1 Flowchart of patient inclusion. ACLR: Anterior cruciate ligament reconstruction.



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Figure 2 Type of sports at time of return. Lower sports impacts increased before revision anterior cruciate ligament reconstruction at the final follow-up. ACL: Anterior cruciate ligament; ACLR: Anterior cruciate ligament reconstruction.

After primary ACL surgery, 13 (31.0%) returned to the same level of sport, 26 (64.0%) to a lower level and 2 (5.0%) did not RTS. The rate of RTS for revision ACLR was 16 (39.0%) returning to the same level of sport and 25 (61.0%) to a lower level (Table 3). The time to RTS for both post-primary surgery and revision ACLR was 13 mo (IQR 11.0-15.0) (Figure 3).

Eighty percent (12/15) of patients without associated procedures and 73.0% (19/26) of patients with associated procedures returned to the same sports level, with no statistically significant differences ($P = 0.61$). Similarly, we found no association ($P > 0.44$) between the associated procedures performed at the time of revision ACLR surgery and the type of sport.

Regarding impact activity after revision surgery, it is interesting to note that 13.0% [7] modified their sports practice. When classifying sports according to impact based on Tegner, we recorded a 40.0% decrease from high impact to moderate impact activity and a 2.2% decrease from moderate to low impact after 5 years of follow-up after revision ACLR (Table 4) (Figure 2). Of those who played soccer, 1 patient changed to tennis, 1 to functional training and 1 to running. Of those who performed running, 1 began to perform a pivoting activity (soccer) and the other 2 modified it to a low-impact activity (bicycle

Table 3 Return to sport rate after primary anterior cruciate ligament surgery and before revision anterior cruciate ligament reconstruction after a 5-yr minimum follow-up

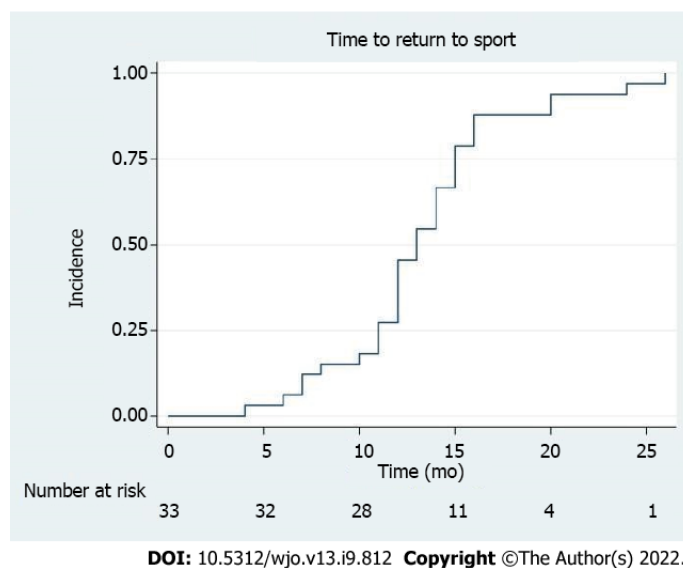
	Return to sports rate	
	Primary ACLR, %	Revision ACLR, %
Total return	95.0	100
Same level	31.7	39.0
Lower level	63.4	61.0

ACLR: Anterior cruciate ligament reconstruction.

Table 4 Activity sports impact and time evolution

Impact sport and Tegner	Prior to primary ACLR, <i>n</i> (%)	At 5 yr revision ACLR, <i>n</i> (%)
Low	1 (2.4)	2 (4.8)
Moderate	5 (12.2)	20 (48.7)
High	35 (85.3)	19 (46.3)

ACLR: Anterior cruciate ligament reconstruction.

**Figure 3** Time to return to sports (Kaplan - Meier). Fifty percent of the population returned to sport at some level 13 mo after revision anterior cruciate ligament reconstruction.

and yoga). This result was not modified for patients older than 40 years, in contrast to what it may be thought that in older patients (older than 40 years) the chances of modifying or abandoning sport is higher. The frequency with which they practiced sports in a week before and after the revision ACLR was maintained over time, being an average of twice a week (range 1-3); 26 (63.0%) patients practiced activities twice a week before the revision ACLR and 21 (51.0%) post-surgery.

When assessing motivation, 26 (63.0%) classified it as very important and 15 (37.0%) as important. When the patients were asked about their expectations regarding the RTS after their primary ACL surgery, 33 (80.0%) patients described their intention to return to the same sports level and 8 (20.0%) to return to a lower level. Regarding their expectation after revision ACLR surgery, 16 (39.0%) patients intended to return to the same level and 25 (61.0%) to a lower level (Table 3).

Clinical evaluation

According to the American Heart Association's classification in relation to Tegner score, a 40.0% decrease in impact activities at 5 years postoperatively was registered. Tegner score prior to primary

ACL surgery showed that 80.5% performed recreational physical activity, 9.8% performed their usual light work and 9.8% performed competitive sports activity. After primary ACL surgery, 58.5% performed their usual work, 36.6% performed recreational physical activity and 4.9% performed competitive sports activity. Post revision ACLR, 53.7% performed recreational physical activity, 41.5% performed their usual work/task and 4.9% performed competitive sports activity.

Prior to revision ACLR surgery the Lysholm score was good in 1.9% of the series, 35.8% were fair, and 62.3% were poor. For postoperative revision ACLR the score was excellent in 31.7% of the series, good in 56.1%, fair in 7.3% fair and poor in 4.9%. The Tegner, Lysholm and IKDC scores are summarized in [Table 5](#). With the differential KT-1000 arthrometer the median values prior to ACL revision were 5 mm (IQR: 4.0-6.0) and at last follow-up 3 mm (IQR: 1.5-4.0). Finally, 1 patient had a failure after ACL revision surgery (2.4%) at 72 mo postoperatively.

DISCUSSION

The main finding of this study was that all patients returned to their sports practice after revision ACLR, 61.0% at a lower level and 39.0% at the same level prior to revision ACLR surgery. The rate of return to full sport, according to a systematic review of 48 studies with 5770 patients, is 82% in patients with primary ACL surgery. Only 63% returned to the same pre-injury sport, but 44% were able to do so at a competitive level[19]. Although the literature is more limited for RTS in revision ACLR surgery, a systematic review of 23 studies with a total of 1090 patients indicated that 85% of patients returned to sport, 53% to their previous sport and 51% to a competitive level[16]. According to another systematic review, the rate of RTS in patients with revision ACLR surgery ranged from 56% to 100%[33], similar to our series.

There are several factors that influence RTS: social, psychological and demographic factors. Age and sex are important factors. Men have a 10% higher rate of return than women, and young people (< 25 years) have a rate higher than 30% compared to adult patients[19,20,31,33]. The longer the time between ACL re-rupture and revision surgery, the lower the rates of RTS as well as an increase in associated injuries as revision surgery is delayed[19]. In the same way, the graft choice could be a determining factor in the RTS; however, it has not been studied in depth[27].

In our series, the time to RTS was the same (13 mo) with no significant differences found when dividing the series into those older than 25 years and those younger than 25 years as well as when differentiating between sex. The median time between ACL re-rupture and revision ACLR was 21 mo (IQR: 3.0-24.0). For patients who took more than 1 year to undergo a revision ACLR, the RTS was also at 13 mo on average (7 to 26) with no significant differences with the overall rate of sports return ($P = 0.64$).

Focusing on the graft choice, according to a meta-analysis of 32 studies comparing hamstring and bone tendon bone for revision surgeries, an increase in the IKDC, Lysholm and Tegner scores and a decrease in complications and reoperations was observed in favor of hamstrings[40]. In contrast to this, the authors of the study recommended that the graft choice should be based on the circumstances of each patient, the technique preferred by each surgeon, the tunnel widening, the type of graft previously used and the possible availability of allografts and not on the rate of RTS according to the type of graft [40]. All patients in our series were treated with autografts with the exception of 5 patients where allografts were used. We did not find significant differences in the time to return in patients where an allograft was used, being 13 mo for both groups. The preference of the authors of this study is to use an autograft from the same injured knee. This is due to the fact that, according to literature, series of patients with revision surgeries in which an autograft was used showed faster rates of RTS in comparison with those in which allografts were used[38,39]. The use of contralateral hamstring tendons for revision ACLR surgeries presented similar subjective and objective rates at 5.2 years of follow-up compared to revision surgeries in which patellar or Achilles tendon allograft was used[39]. In our series we do not have patients operated with contralateral knee grafts.

Several authors recommend that when evaluating series to assess the RTS the Lysholm score should be used together with the Tegner score to be able to more effectively evaluate the sports activity[34]. In our series, Lysholm score after revision ACLR increased by 30.0% for excellent results considered as greater than 95 points (0% preoperative to 31% postoperative) and decreased by 50.0% for poor results (62% preoperative to 4.9% postoperative).

For the Tegner scale we observed a decrease of 1.7 points between preoperative primary ACL surgery and postoperative revision ACLR ($P = 0.002$) showing the decrease in impact activity between primary surgery and revision ACLR. When comparing our series with the literature for both the Lysholm, Tegner and IKDC scores we found results that are close to the mean ([Table 6](#)).

When evaluating the expectation of patients regarding their intention to RTS after primary ACL surgery, 80.0% of our series intended to return to the same sport level, while 39.0% reported this intention prior to revision surgery ([Tables 7-10](#) case examples). This 40.0% decrease in the expectation of RTS is consistent with the literature as shown by a study of 675 patients with a return expectation after primary surgery at 1 year of 84% and 63% for revision ACLR surgeries ($P < 0.001$ and $P = 0.08$, respectively). A multivariate logistic regression showed two determinant factors for abandoning sports

Table 5 Tegner, Lysholm and subjective International Knee Documentation Committee scores prior to revision anterior cruciate ligament reconstruction and at the 5-yr follow-up

	Preoperative	SD	5 yr postoperative	SD	Delta	SD	95%CI	P value
Tegner	6.7	(1.3)	5.6	(1.6)	-1.170	(1.8)	-1.739 to -0.602	0.002
Lysholm	58.8	(16.0)	89.0	(8.0)	30.121	(17.0)	24.736 to 35.507	< 0.001
IKDC	50.0	(11.0)	82.0	(9.0)	31.475	(15.0)	26.649 to 36.300	< 0.001

χ^2 test was used to estimate the *P* value. SD: Standard deviation; IKDC: International Knee Documentation Committee; CI: Confidence interval.

Table 6 Comparing our series with the literature for the Lysholm, Tegner and International Knee Documentation Committee scores

Ref.	N	Years	F-up in yr	RTS	IKDC	Lysholm	Tegner	KT-1000, mm $\pm$ SD	KOOS
Battaglia <i>et al</i> [28], 2007	63	31	6.1	42 (66%) same level	G/E 36%; P 17%; F 11%	-	-	< 3	-
Diamantopoulos <i>et al</i> [29], 2008	107	39	6	39 (36%) same level	G/E 57%; P 34%; F 7%	88.5 $\pm$ 12.4	6.3 $\pm$ 1.8	0.93 $\pm$ 1.15	-
Gifstad <i>et al</i> [30], 2013	56	26	7.5	7 (13%) same level	-	80 $\pm$ 15	6 $\pm$ 4	3.3 $\pm$ 2.7	70 $\pm$ 21
Shelbourne <i>et al</i> [31], 2014	259	22	7.2	178 (68%) same level	Subjective 76 $\pm$ 18.3	-	-	2.3 $\pm$ 1.7	-
Ortiz <i>et al</i>, 2022	41	29	5.8	61% same level & 39% lower level	G/E 43%; P 53%; F 4%	89 $\pm$ 8	5.6 $\pm$ 1.6	3 $\pm$ 1.2	-

N: Number of patients; F-up: Follow up; RTS: Return to sport; IKDC: International Knee Documentation Committee; G/E: Good to excellent; P: Poor; F: Fair; SD: Standard deviation; KOOS: Knee Injury and Osteoarthritis Outcome Score.

Table 7 Five representative cases

Case	Sex	Years	Time between in min				Graft choice		Augmentation at revision ACLR	Concomitant lesions
			Primary ACLR and retear	Revision ACLR and last evaluation, F-up	Return to sport		Primary	Revision		
					To Primary ACLR	To Revision ACLR	ACLR	ACLR		
1	Male	30	36	126	17	20	Hamstring	BPTB	Lemaire	Medial meniscus tear
2	Male	42	12	131	14	13	Hamstring	BPTB	Lemaire	Medial meniscus tear
3	Male	29	48	107	13	11	Hamstring	BPTB	Lemaire	Chondral lesions
4	Male	35	22	115	10	14	Hamstring	BPTB	-	Chondral lesions
5	Female	28	13	103	14	16	Hamstring	BPTB	-	Medial meniscus tear

ACLR: Anterior cruciate ligament reconstruction; BPTB: Bone patellar tendon bone; F-up: Follow-up.

practice, which were having suffered a revision ACLR ($P < 0.0001$) and being female ($P = 0.02$). In our series, all patients returned to sports, and we did not obtain representative casuistry to make a comparison between sexes[34].

The association between chondral and meniscal lesions showed poor functional results in patients with revision ACLR surgery; the association of chondral lesions at the time of revision surgery showed lower values according to the Lysholm score in comparison with patients who did not present it. In the same way, patients who presented this lesion modified their intensity in RTS[34-37]. Another study showed poor results in Marx, Knee Injury and Osteoarthritis Outcome Score-quality of life and IKDC

Table 8 Return to sport was considered to be the return to their sport prior to the last injury, at the same level or below the previous level

Case	Sex	Years	Return to sport		Type of Sports			Training frequency	
			After		Prior ACLR	Prior revision ACLR	After revision ACLR	Days per week	
			Primary ACLR	Revision ACLR				Prior revision ACLR	After revision ACLR
1	Male	30	Lower level	Lower level	Soccer	Running	Running	2	1
2	Male	42	Same level	Same level	Soccer	Soccer	Tennis	2	1
3	Male	29	Lower level	Same level	Soccer	Running	Soccer	2	2
4	Male	35	Lower level	Same level	Soccer	Soccer	Soccer	2	2
5	Female	28	Lower level	Same level	Martial arts	Tennis	Tennis	2	2

ACLR: Anterior cruciate ligament reconstruction.

Table 9 Motivation was classified as very important, important, moderately important, minimally important or not important and expectation was classified as return to the same sport level, return to a lower level or not returning to the same sport

Case	Sex	Year	Motivation	Expectation	
				After primary ACLR	After revision ACLR
1	Male	30	Important	Same level	Lower level
2	Male	42	Very important	Same level	Same level
3	Male	29	Very important	Same level	Lower level
4	Male	35	Very important	Same level	Lower level
5	Female	28	Very important	Same level	Same level

ACLR: Anterior cruciate ligament reconstruction.

Table 10 Knee function and sports activity level

Case	Sex	Year	Tegner		Lysholm		IKDC	
			Prior revision ACLR	At 5-yr F-up revision ACLR	Prior revision ACLR	At 5-yr F-up revision ACLR	Prior revision ACLR	At 5-yr F-up revision ACLR
1	Male	30	7	4	47	65	62	71
2	Male	42	7	7	61	84	49	89
3	Male	29	7	4	39	86	59	90
4	Male	35	7	4	80	95	37	97
5	Female	28	7	6	38	86	49	86

ACLR: Anterior cruciate ligament reconstruction; F-up: Follow-up; IKDC: International Knee Documentation Committee.

activity scores after revision ACLR surgery in patients with chondral lesions and low scores for the Marx and Knee Injury and Osteoarthritis Outcome Score-quality of life scores in patients with medial meniscus lesions[29]. The level of RTS practice was equal or lower in patients who had associated injuries *vs* patients who did not have associated injuries at the time of revision ACLR surgery. Twelve patients returned to the same level; 3 patients returned to a lower level out of a total of 15 patients who underwent an associated procedure. In our series, 80.0% (12/15) of the patients without associated procedures and 73.0% (19/26) of the patients with associated procedures returned to the same sports level, with no statistically significant differences ($P = 0.61$).

Limitations

Among the limitations of our retrospective study, there was no control group of patients with high sports performance nor a numerical scale detailing the level of RTS practice, being this a subjective response of patients. No pre- and postoperative strength or resistance test was performed to determine the “level of muscle strength at their return.” The series was a heterogeneous group of patients in terms of age and type of sport performed. Although the size of the series is close to those reported in international literature, the number is small. The strength of the study is that it is a case series operated in a single institution with a 5-year follow-up after revision ACLR.

CONCLUSION

Five years after a revision ACLR, 39.0% of patients returned to the same level of sport as before revision ACLR surgery and 61.0% to a lower level. The 13.2% ($n = 7$) of the series who changed their sports practice was a 40.0% decrease of high impact activity at the time of return. These data could be used to advise patients on the level and timing of sports return.

ARTICLE HIGHLIGHTS

Research background

Between 43% and 75% of patients who undergo primary anterior cruciate ligament (ACL) surgery return to sport activity. However, after a revision ACL reconstruction (ACLR) rate of return to sport are variable. Few publications report return to sports incidence between 56% to 100% after revision ACLR. Five-year minimum follow-up after revision ACLR is a good mid/long-term period evaluation to report return to sport of a case series patients.

Research motivation

Return to sports is a frequent question from patients during the first consultation. We believe this research could help other knee surgeons answer these types of questions. Motivation and expectation must be asked by surgeons during the consultation so as to give the patient a more detailed and realistic response to that question.

Research objectives

The objective was to report functional clinical outcomes and return to sport at a mid/long-term period after revision ACLR.

Research methods

A retrospective and observational study was performed to describe return to sport of an amateur case series of patients. The entire cohort was asked about motivation, expectation, intensity, frequency and level of return to sport after a 5-year follow-up after revision ACLR.

Research results

Thirty-nine percent of the cohort returned at the same level compared to the pre-injury period. Sixty-one percent returned at a lower level. Sixty-three percent categorized the sport as very important and 37.0% as important. One patient (2.4%) failed with a recurrent torn ACL.

Research conclusions

Almost 40.0% of patients returned to their pre-injury sport level and 60.0% to a lower level after 5 years of follow-up after revision ACLR.

Research perspectives

The direction of future research must be to compare return to sport of professional elite patients against amateur patients.

ACKNOWLEDGEMENTS

The authors thank Dr. Marciano S from the Research Department of the Hospital Italiano de Buenos Aires for his participation in the research protocol and statistical analysis.

FOOTNOTES

Author contributions: Ortiz E and Zicaro JP designed the research study; Ortiz E performed the research; Yacuzzi C and Costa Paz M contributed new reagents; Garcia Mansilla I contributed with analytic tools; Ortiz E and Zicaro JP analyzed the data and wrote the manuscript; All authors have read and approved the final manuscript.

Institutional review board statement: This study was reviewed and approved by the Ethics Committee of the Hospital Italiano de Buenos Aires, No. #3213.

Informed consent statement: Patients were required to give informed consent to the study.

Conflict-of-interest statement: All authors report no relevant conflict of interest for this article.

Data sharing statement: No additional data are available.

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S-Editor: Wu YXJ

L-Editor: Filipodia

P-Editor: Wu YXJ

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