Return to Sports After Arthroscopic Rotator Cuff Repair in Recreational Athletes

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ABSTRACT

Objective: To assess return to sports in recreational athletes after arthroscopic rotator cuff repair (ARCR). **Materials and Methods:** Retrospective single-site study of recreational athletes who were operated on between August 2019 and December 2020 for ARCR, with a minimum follow-up of one year. Patients were divided into 2 groups based on their shoulder demand: high or low. The primary endpoint was return to sports. Secondary criteria included time to return, level achieved, pre and postoperative VAS for pain, and ASES and Constant scores. The minimal clinically important difference (MCID) and substantial clinical benefit (SCB) were calculated. Complications were recorded. **Results:** A total of 102 patients (mean age: 58.7 years) were included. Seventy patients practiced a sport with high shoulder involvement. The mean follow-up was 18 months. 82.3% of patients returned to recreational sports, with 63 participating at the same level. The median time to return was six months. Return to sports was 91% in the low-shoulder demand group versus 79% in the high-shoulder demand group. VAS, Constant and ASES scores improved after six and twelve months. For the ASES and Constant scores, 98 and 100% of patients met the MCID and SCB, respectively. A total of eight patients reported persistent pain. Five patients required revision surgery. **Conclusion:** Most recreational athletes who undergo ARCR are able to resume their previous level of activity. Most athletes achieved significant clinical improvement with a low rate of complications (7.8%).

Keywords: Shoulder; rotator cuff; return to sports; recreational sports.
Level of Evidence: IV

Retorno al deporte recreativo luego de la reparación artroscópica del manguito rotador

RESUMEN

Objetivo: Evaluar el retorno al deporte recreativo luego de una reparación artroscópica del manguito rotador. **Materiales y Métodos:** Se realizó un análisis retrospectivo de atletas recreativos sometidos a una reparación artroscópica del manguito rotador entre agosto de 2019 y diciembre de 2020 (seguimiento mínimo 1 año). Se los dividió en dos grupos: alta y baja demanda del hombro. El resultado principal evaluado fue el retorno al deporte y los resultados secundarios fueron: tiempo de retorno, nivel alcanzado, escala analógica visual pre y posoperatoria para dolor; escalas ASES y Constant. Se calcularon la diferencia mínima clínicamente importante y el beneficio clínico sustancial. Se registraron las complicaciones. **Resultados:** Se incluyó a 102 pacientes (media de edad 58.7 años). Setenta practicaban un deporte de alta demanda para el hombro. La media de seguimiento fue de 18 meses. El 82,3% volvió al deporte; 63, al mismo nivel. La mediana hasta el regreso fue de 6 meses. El 91% de los deportistas con baja demanda para el hombro y el 79% con alta demanda retornaron al deporte. Los puntajes de las escalas mejoraron a los 6 y 12 meses. El 98% y el 100% alcanzaron la diferencia mínima clínicamente importante y el beneficio clínico sustancial para las escalas ASES y Constant, respectivamente. Ocho tenían dolor persistente. Cinco fueron sometidos a una cirugía de revisión. **Conclusión:** La reparación artroscópica del manguito rotador en deportistas recreativos logró muy buenos resultados funcionales con una alta tasa de retorno deportivo al mismo nivel y un 7,8% de complicaciones.

Palabras clave: Hombro; manguito rotador; retorno al deporte; deporte recreativo.
Nivel de Evidencia: IV

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INTRODUCTION

Rotator cuff tears (RCT) are a common cause of shoulder pain and dysfunction. The reported prevalence of these injuries in the general population is 9.7% in patients under 20 years old and 62% in those over 80 years old.[1,2] Arthroscopic repair of these lesions is the treatment of choice, as recovery times are shorter than with open techniques, and long-term functional outcomes are identical.[3,4]

With the increase in life expectancy, the number of elderly people (over 55 years) who engage in physical activity for its health benefits and as a social activity is growing.[5] RCTs are common in this subgroup of patients and can limit or even prevent sports participation.[1]

Most published studies on return to sport after rotator cuff repair surgery focus on competitive athletes.[6-9] The main systematic reviews yield conflicting results when comparing the return to sport between this type of athlete and recreational athletes.[6,10] This controversy is due, in part, to the scarcity of publications on return to sport in the latter group of patients.[11,12]

The main objective of this study was to evaluate the proportion of patients who returned to recreational sports after undergoing surgery for RCT. The secondary objectives were to assess the proportion of patients who returned to the same level of sport as before the injury, both in general and according to the level of shoulder demand, as well as to evaluate the functional outcomes and the number of patients who reached the minimal clinically important difference (MCID) and substantial clinical benefit (SCB).[13,14] Finally, complications and reinterventions were recorded.

MATERIALS AND METHODS

Patients who underwent arthroscopic repair of a rotator cuff tear (RCT) between August 2019 and December 2020 were retrospectively identified.

Patients were included if they practiced a recreational sport at least once a week and had a complete unilateral RCT confirmed by preoperative MRI (involving the supraspinatus, infraspinatus, or subscapularis), with a tear size of <3 cm, no retraction (Patte classification grade I), mild to moderate atrophy (Goutallier classification grades 0-3), and a minimum follow-up of one year. Exclusion criteria included partial tears, revisions or massive/irreparable RCTs, not practicing sports, and being unreachable at the end of the follow-up period.

Preoperative and postoperative evaluations consisted of a physical examination by a shoulder surgeon or fellow, specific functional scales for the upper limb (*American Shoulder and Elbow Surgeons* [ASES] and Constant scales), and the visual analog scale (VAS) for pain, ranging from 0 to 10, where 0 represents no pain and 10 represents the maximum pain imaginable. Patients were monitored at 3, 6, and 12 months after surgery and then annually. They were asked if they practiced a sport before surgery, what type of sport, whether they were able to return to it after the procedure, how long it took, and at what level. If they had not been able to return to their sport, they were asked why.

Patients were divided into two groups based on the shoulder's involvement in their sport: a high-demand group and a low-demand group. After collecting the preoperative and postoperative functional scale scores, the number of patients who achieved the minimal clinically important difference (MCID) and substantial clinical benefit (SCB) according to the values established by Cvetanovich et al. was determined.[15] The ASES scale scores were 11.1 and 17.5, respectively, and the Constant scale scores were 5.5 in both cases.

During the study period, 206 patients underwent arthroscopic repair for RCT. Of these, 107 patients met the inclusion criteria, with five (4.7%) being unreachable. A total of 102 patients (95.3%) were analyzed (Figure 1).

The group consisted of 32 women and 70 men, with a mean age of 58.7 years (standard deviation [SD] 10.8) at the time of surgery. Demographic data are summarized in Table 1.

The average tear size was 2 cm (SD 1.2) in the coronal plane and 2.3 cm (SD 0.5) in the sagittal plane. Fat atrophy was grade 1 in 52 patients (48.6%), grade 2 in 39 (36.4%), and grade 3 in 16 (15%). The most common recreational sports were tennis (17.6%), gymnastics (13.7%), golf (11.7%), and gym activities (11.7%). A total of 68.6% (70 patients) participated in a sport with high demand on the shoulder (tennis, swimming, paddle tennis, paddleball, squash, gym activities, volleyball, taekwondo, crossfit, boxing, climbing, soccer), while 31.4% (32 patients) engaged in less demanding activities for the upper limb (hiking, gymnastics, running, cycling). The dominant side was affected in 82 patients (80.4%). The mean follow-up was 18 months (range 12-24 months).

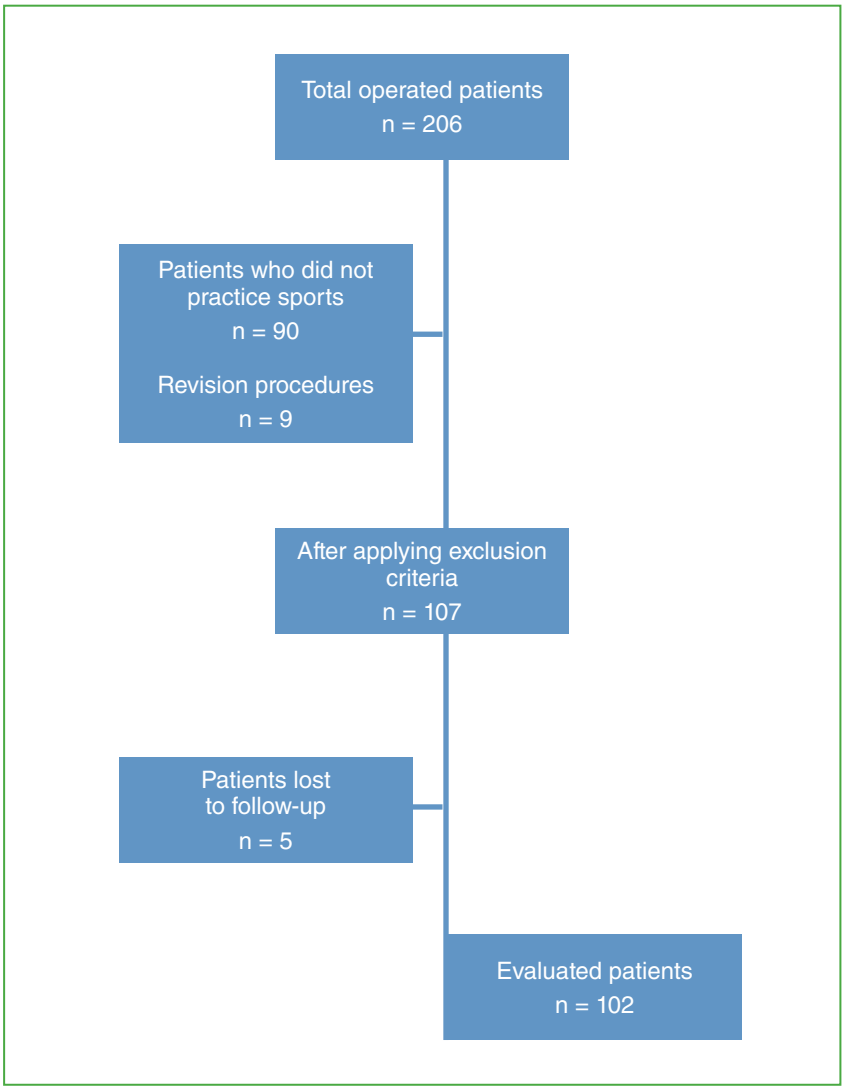

Figure 1. Flowchart of inclusion and exclusion of patients in the series.

Table 1. Demographic data of the series.

	Total (n = 102)	Did not return to sport (n = 18)	Returned to sport (n = 84)	p
Age (years), mean (SD)	58.7 (10.8)	58.3 (12.5)	58.8 (10.5)	0.884
Gender, n (%)	70 (68.6%)	13 (72.2%)	57 (67.9%)	0.934
Dominant shoulder, n (%)	82 (80.4%)	14 (77.8%)	68 (81.0%)	0.749
Time (months), mean (range)	18 (12-24)	-	18 (12-24)	.

SD = standard deviation.

Surgical technique

The patients were operated on in the beach chair position under general anesthesia with a regional interscalene block. All repairs were performed by three surgeons specializing in shoulder pathology, using the same transosseous-equivalent technique. A standard posterior visualization portal was used, through which a 30° arthroscope was introduced. Under direct vision and with the aid of a needle, an anterior portal was created through the rotator interval. Exploratory arthroscopy was then performed. Once the injury was identified, the arthroscope was moved to the subacromial space to perform a slight bursectomy with a shaver and radiofrequency until adequate visualization was achieved. An anterolateral accessory portal was used for anchor placement and suture management.

Before the repair, the tendon insertion area was prepared by reaming it until a bleeding bed was obtained. Depending on the size of the lesion, one or two 5-mm anchors with double-row sutures were placed at the level of the humeral articular cartilage margin. The sutures were passed through the tendon using pigtail needles, from anterior to posterior, approximately 1 cm proximal to the tear. When a single medial anchor was placed, the sutures were retrieved above the lesion and fixed laterally with a sutureless anchor. When two medial anchors were placed, one suture from each anchor was retrieved and fixed in a crisscross fashion with two lateral anchors separated by 1 cm from each other to complete the configuration. The sutures were tensioned under direct vision before inserting the lateral anchors. Finally, all sutures were trimmed, and the repair was examined with a probe. Figure 2 presents a case as an example.

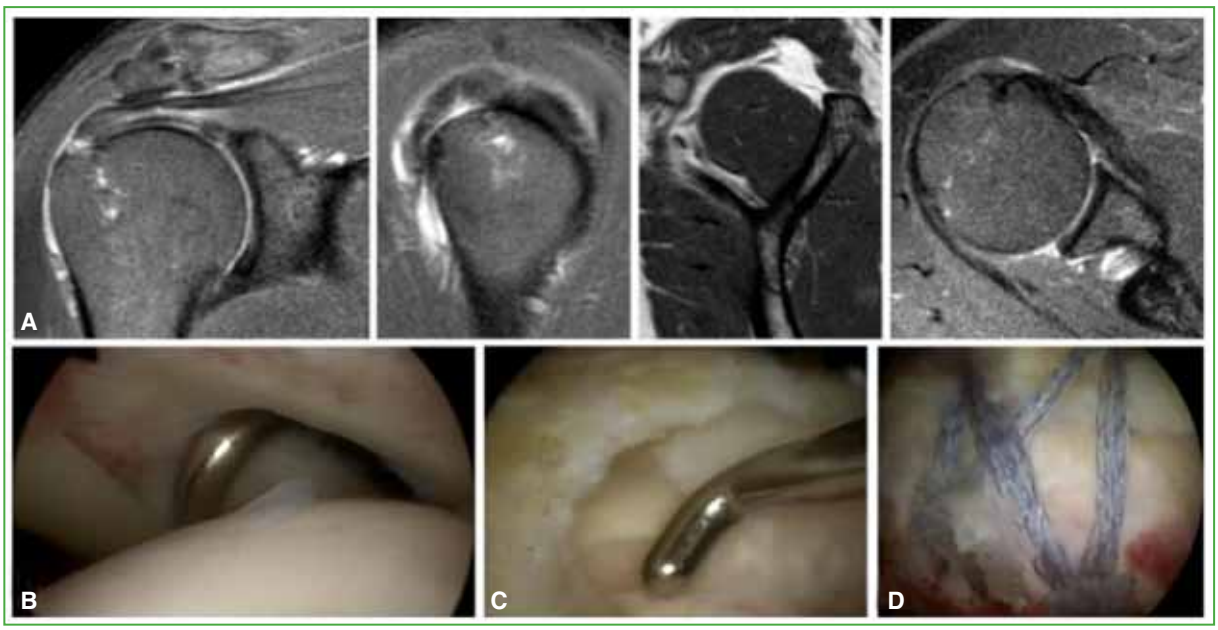

Figure 2. 60-year-old patient with right supraspinatus injury. **A.** Magnetic resonance images. A complete insertional injury of the supraspinatus is observed. **B.** Intrarticular view of the injury. **C.** Subacromial view of the injury. **D.** Final subacromial view of the repair. Two medial and two lateral anchors were used.

Postoperative protocol

All patients followed the same postoperative rehabilitation protocol. For the first four weeks, the arm was rested in a sling, with exercises for hand, wrist, and elbow mobilization. After one month, formal physical therapy began, starting with pendulum movements, progressive passive mobilization, and assisted active mobilization of the shoulder. Once anterior flexion greater than 90º was achieved, strengthening exercises were introduced, initially with elastic bands and then progressively with weights until a full active range of motion was restored. Patients were allowed to begin running eight weeks after surgery. Return to sport was permitted when the patient was pain-free, had regained full range of motion, and had strength close to pre-injury levels.

Statistical analysis

Demographic and outcome data were analyzed descriptively. Continuous variables are presented as mean and standard deviation (SD) or as median and interquartile range (IQR), depending on the distribution. Categorical variables are expressed as absolute and relative frequencies. Independent continuous variables were compared using either the t-test or the Mann-Whitney test, depending on their distribution. Categorical variables were compared using the chi-squared test or Fisher's exact test, as appropriate. All tests were two-tailed. Pre- and postoperative functional scales were compared using a paired t-test. STATA version 12 (StataCorp, College Station, TX, USA) was used for the analysis. A p-value of <0.05 was considered statistically significant.

RESULTS

Return to sport

Eighty-four patients (82.3%) were able to return to recreational sport by the end of the follow-up period (median 6 months [IQR 4-7]). Sixty-three of these patients returned to their pre-injury level of sport (76%, 95% confidence interval [95% CI] 65%-84%), while 18 returned at a lower level (22%, 95% CI 13%-32%), and two returned at a higher level (2%, 95% CI 0.3%-8%).

Eighteen patients (17.6%) were unable to resume their sport after the procedure: seven stopped due to persistent shoulder pain (6.9%), six due to fear or caution (5.9%), two due to work commitments (2%), and three due to other causes unrelated to the shoulder (2.9%).

Ninety-one percent of those who played low-demand sports for the shoulder and 79% of those in the high-demand group were able to return to sport (p = 0.17). In terms of time to return to sport, the low-demand group had a median of 3 months (IQR 3-6), while the high-demand group had a median of 6 months (IQR 5-9) (p < 0.01). Ninety-three percent of the low-demand patients returned to their previous level of sport compared to 70% of the high-demand group (p = 0.015).

Clinical results

The preoperative and postoperative scores on the VAS pain and functional scales are shown in Table 2. The improvement in scores on the VAS and functional scales was statistically significant at both 6 and 12 months postoperatively (Figure 3).

Table 2. Preoperative and postoperative scores on the clinical scales.

Functional scale	Before surgery	6 months after surgery	12 months after surgery	p
VAS	7.49 (1.73)	2.84 (2.22)	1.66 (2.04)	<0.001
Constant	31.2 (13.4)	75.7 (15.6)	89.0 (12.3)	<0.001
ASES	29.8 (14.1)	76.7 (15.8)	89.2 (12.7)	<0.001

VAS = visual analog scale; ASES = *American Shoulder and Elbow Surgeons Score*.

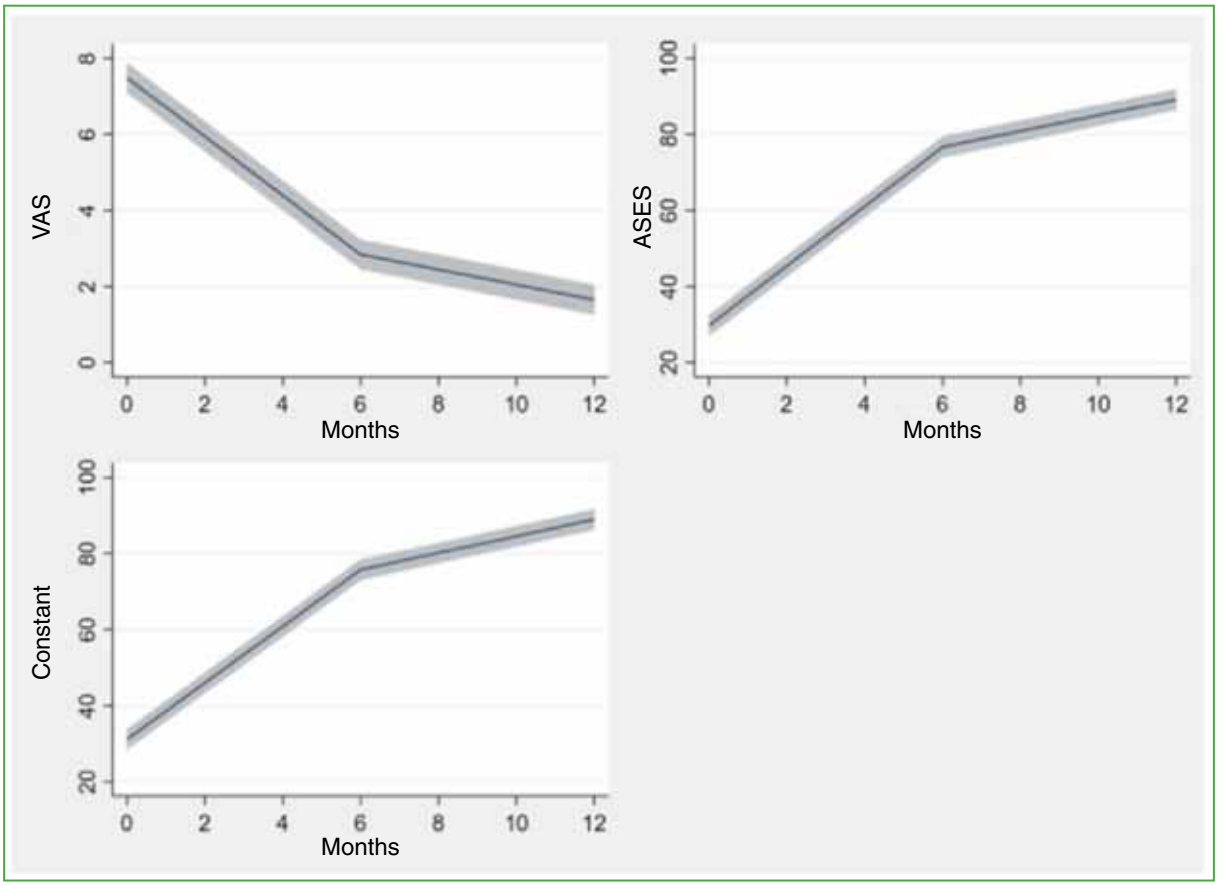

Figure 3. Progression of clinical scales before surgery and after 6 and 12 months. A marked decrease in the score on the visual analog scale (VAS) of pain is observed, as well as a progressive increase in the scores on the functional scales.
ASES = *American Shoulder and Elbow Surgeons Score*.

Regarding the ASES scale, 98% of patients achieved both the MCID and SCB. All patients achieved both the MCID and SCB on the Constant scale.

Complications

Eight patients (7.8%) experienced persistent pain at the end of follow-up, five of whom were unable to return to sport. Five patients (4.9%) suffered a re-tear and required reoperation. Four of these belonged to the high-demand shoulder group, and one to the low-demand group.

DISCUSSION

The most important finding of our study is that 82% of the patients were able to return to their recreational sport, with 76% of them reaching the same level as before the injury. Additionally, 98% of patients met the MCID and SCB criteria on the ASES scale. All patients experienced a statistically significant improvement in pain on the VAS and achieved both the MCID and SCB on the Constant scale.

To our knowledge, this study represents the largest series to evaluate return to exclusively recreational sport after rotator cuff tear (RCT) surgery, and the only one to report specific clinical measures such as MCID and SCB. In 2016, Antoni et al.[11] evaluated clinical outcomes and return to recreational sport in a series of 76 patients after arthroscopic rotator cuff repair. After a minimum follow-up of 2 years, 88.2% were able to resume a recreational sport, but only 68.4% returned to the same sport they played before surgery; the average return time was 6 ± 4.9 months. Our results were similar, with just over 80% of patients returning to their sport after a median of 6 months.

In professional athletes, despite satisfactory clinical outcomes, the rate of return to sport after RCT is often lower than in recreational athletes. In their 2015 systematic review and meta-analysis, Klouche et al.[6] reported an overall return-to-sport rate of close to 85%, with 66% of patients reaching their preinjury sport level between 4 and 7 months after surgery. The return rate was significantly higher in recreational athletes (82.4%) than in those who played competitively or professionally (49.9%). In our series, which focused solely on recreational athletes, the overall return rate was 82.3%, with 76% returning to the same level of sport.

In a more recent systematic review and meta-analysis, Altintas et al.[10] evaluated 15 studies involving 486 patients (499 shoulders) and reported an overall return-to-sport rate of 85.5%. Interestingly, and in contrast to Klouche et al.,[6] despite a difference in return rates between competitive and recreational athletes (84.8% vs. 86.4%), this difference was not statistically significant. The reported rate of return to the same level was 70.2%. Recreational sports were associated with a higher return-to-sport level rate (73.3%), while competitive sports (61.5%), especially those involving overhead maneuvers, were associated with a lower rate (38%). In the latter group, the rate of return to the same level dropped to 30% when the affected shoulder was the dominant one.[16-18] Our results are consistent with these findings, as 93% of patients participating in low-demand sports for the shoulder were able to return to their pre-injury sport level, while only 70% of those involved in high-demand activities for the shoulder were able to do so.

The differences in results obtained in the aforementioned meta-analyses may be due, in part, to the fact that Klouche et al.[6] evaluated open, mini-open, and arthroscopic procedures interchangeably, while Altintas et al.[10] focused only on arthroscopic rotator cuff repairs. Given the high physical demands on competitive athletes, the increased soft tissue trauma and adhesion formation associated with open procedures may have greater consequences on competitive athletes than on recreational athletes.[19-21] Arthroscopic techniques aim to minimize soft tissue impingement and scar tissue formation, offering a shorter recovery time compared to open procedures and potentially allowing for a higher and faster return to sport.[22,23] With these factors in mind, our series consisted exclusively of patients who underwent arthroscopic surgery with a transosseous-equivalent repair technique.

Our study has limitations. It is a retrospective series with inherent limitations. Furthermore, a group of patients treated with a different surgical method was not studied. Finally, all athletes were treated with the same institutional physical rehabilitation protocol.

CONCLUSION

Arthroscopic rotator cuff repair in recreational athletes achieved very good functional outcomes, with a high rate of return to sport at the pre-injury level and a 7.8% complication rate.

Conflict of interest: The authors declare no conflicts of interest.

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REFERENCES

1. Teunis T, Lubberts B, Reilly BT, Ring D. A systematic review and pooled analysis of the prevalence of rotator cuff disease with increasing age. *J Shoulder Elbow Surg* 2014;23(12):1913-21. https://doi.org/10.1016/j.jse.2014.08.001
2. Yamamoto A, Takagishi K, Osawa T, Yanagawa T, Nakajima D, Shitara H, et al. Prevalence and risk factors of a rotator cuff tear in the general population. *J Shoulder Elbow Surg* 2010;19(1):116-20. https://doi.org/10.1016/j.jse.2009.04.006

3. Ji X, Bi C, Wang F, Wang Q. Arthroscopic versus mini-open rotator cuff repair: An up-to-date meta-analysis of randomized controlled trials. *Arthroscopy* 2015;31(1):118-24. https://doi.org/10.1016/j.arthro.2014.08.017
4. Baker CL, Liu SH. Comparison of open and arthroscopically assisted rotator cuff repairs. *Am J Sports Med* 1995;23(1):99-104. https://doi.org/10.1177/036354659502300117
5. Stenner BJ, Buckley JD, Mosewich AD. Reasons why older adults play sport: A systematic review. *J Sport Health Sci* 2020;9(6):530-41. https://doi.org/10.1016/j.jshs.2019.11.003
6. Klouche S, Lefevre N, Herman S, Gerometta A, Bohu Y. Return to sport after rotator cuff tear repair: A systematic review and meta-analysis. *Am J Sports Med* 2016;44(7):1877-87. https://doi.org/10.1177/0363546515598995
7. Namdari S, Baldwin K, Ahn A, Russell Huffman G, Sennett BJ. Performance after rotator cuff tear and operative treatment: A case-control study of major league baseball pitchers. *J Athl Train* 2011;46(3):296-302. https://doi.org/10.4085/1062-6050-46.3.296
8. Harris JD, Frank JM, Jordan MA, Bush-Joseph CA, Romeo AA, Gupta AK, et al. Return to sport following shoulder surgery in the elite pitcher: a systematic review. *Sports Health* 2013;5(4):367-76. https://doi.org/10.1177/1941738113482673
9. Mazoué CG, Andrews JR. Repair of full-thickness rotator cuff tears in professional baseball players. *Am J Sports Med* 2006;34(2):182-9. https://doi.org/10.1177/0363546505279916
10. Altintas B, Anderson N, Dornan GJ, Boykin RE, Logan C, Millett PJ. Return to sport after arthroscopic rotator cuff repair: Is there a difference between the recreational and the competitive athlete? *Am J Sports Med* 2020;48(1):252-61. https://doi.org/10.1177/0363546519825624
11. Antoni M, Klouche S, Mas V, Ferrand M, Bauer T, Hardy P. Return to recreational sport and clinical outcomes with at least 2years follow-up after arthroscopic repair of rotator cuff tears. *Orthop Traumatol Surg Res* 2016;102(5):563-7. https://doi.org/10.1016/j.otsr.2016.02.015
12. Bhatia S, Greenspoon JA, Horan MP, Warth RJ, Millett PJ. Two-year outcomes after arthroscopic rotator cuff repair in recreational athletes older than 70 years. *Am J Sports Med* 2015;43(7):1737-42. https://doi.org/10.1177/0363546515577623
13. Makhni EC, Steinhaus ME, Morrow ZS, Jobin CM, Verma NN, Cole BJ, et al. Outcomes assessment in rotator cuff pathology: what are we measuring? *J Shoulder Elbow Surg* 2015;24(12):2008-15. https://doi.org/10.1016/j.jse.2015.08.007
14. Katz NP, Paillard FC, Ekman E. Determining the clinical importance of treatment benefits for interventions for painful orthopedic conditions. *J Orthop Surg Res* 2015;10:24. https://doi.org/10.1186/s13018-014-0144-x
15. Cvetanovich GL, Gowd AK, Liu JN, Nwachukwu BU, Cabarcas BC, Cole BJ, et al. Establishing clinically significant outcome after arthroscopic rotator cuff repair. *J Shoulder Elbow Surg* 2019;28(5):939-48. https://doi.org/10.1016/j.jse.2018.10.013
16. Azzam MG, Dugas JR, Andrews JR, Goldstein SR, Emblom BA, Cain EL Jr. Rotator cuff repair in adolescent athletes. *Am J Sports Med* 2018;46(5):1084-90. https://doi.org/10.1177/0363546517752919
17. Dines JS, Jones K, Maher P, Altchek D. Arthroscopic management of full-thickness rotator cuff tears in major league baseball pitchers: The lateralized footprint repair technique. *Am J Orthop (Belle Mead NJ)* 2016;45(3):128-33. PMID: 26991564
18. Plate JF, Haubruck P, Walters J, Mannava S, Smith BP, Smith TL, et al. Rotator cuff injuries in professional and recreational athletes. *J Surg Orthop Adv* 2013;22(2):134-42. https://doi.org/10.3113/jsoa.2013.0134
19. Kelly BC, Constantinescu DS, Pavlis W, Rap AR. Arthroscopic versus open rotator cuff repair: Fellowship-trained orthopaedic surgeons prefer arthroscopy and self-report a lower complication rate. *Sports Med Arthrosc Rehabil Ther Technol* 2021;3(6):e1865-e1871. https://doi.org/10.1016/j.asmr.2021.09.001
20. Wang KY, Agarwal AR, Xu AL, Best MJ, Kreulen RT, Jami M, et al. Increased risk of surgical-site infection and need for manipulation under anesthesia for those who undergo open versus arthroscopic rotator cuff repair. *Sports Med Arthrosc Rehabil Ther Technol* 2022;4(2):e527-e533. https://doi.org/10.1016/j.asmr.2021.11.012
21. Kelly BC, Constantinescu DS, Vap AR. Arthroscopic and open or mini-open rotator cuff repair trends and complication rates among American Board of Orthopaedic Surgeons Part II Examinees (2007-2017). *Arthroscopy* 2019;35(11):3019-24. https://doi.org/10.1016/j.arthro.2019.06.022
22. Yamaguchi K, Levine WN, Marra G, Galatz LM, Klepps S, Flatow EL. Transitioning to arthroscopic rotator cuff repair: the pros and cons. *Instr Course Lect* 2003;52:81-92. PMID: 12690842
23. Dey Hazra R-O, Ernat JJ, Rakowski DR, Boykin RE, Millett PJ. The evolution of arthroscopic rotator cuff repair. *Orthop J Sports Med* 2021;9(12):23259671211050899. https://doi.org/10.1177/23259671211050899