

# Return to Sports and Recurrences After Arthroscopic Anterior Shoulder Stabilization in Martial Arts Athletes

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**Background:** The high demands to the glenohumeral joint and the violent shoulder blows experienced during martial arts (MA) could compromise return to sports and increase the recurrence rate after arthroscopic stabilization for anterior shoulder instability in these athletes.

**Purpose:** To report the functional outcomes, return to sports, and recurrences in a series of MA athletes with anterior shoulder instability treated with arthroscopic stabilization with suture anchors.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** A total of 20 consecutive MA athletes were treated for anterior shoulder instability at a single institution between January 2008 and December 2013. Range of motion (ROM), the Rowe score, a visual analog scale (VAS), and the Athletic Shoulder Outcome Scoring System (ASOSS) were used to assess functional outcomes. Return-to-sport and recurrence rates were also evaluated.

**Results:** The mean age at the time of surgery was 25.4 years (range, 18-35 years), and the mean follow-up was 71 months (range, 36-96 months). No significant difference in preoperative and postoperative shoulder ROM was found. The Rowe, VAS, and ASOSS scores showed statistical improvement after surgery ( $P < .001$ ). In all, 19 athletes (95%) returned to sports. However, only 60% achieved  $\geq 90\%$  recovery after surgery. The recurrence rate was 20%.

**Conclusion:** In this retrospective study of a consecutive cohort of MA athletes, arthroscopic anterior shoulder stabilization significantly improved functional scores. However, only 60% of the athletes achieved the same level of competition, and there was a 20% recurrence rate.

**Keywords:** shoulder instability; arthroscopic surgery; martial arts; athletes

The popularity of martial arts (MA) is growing steadily, with an estimated 8 million participants in America alone.<sup>15,19</sup> Tae kwon do and karate have been reported as having over 2 million and 1 million participants, respectively, in the United States.<sup>4</sup> Moreover, judo and tae kwon

do are now official Olympic sports. The increased popularity and the violent characteristics of many forms of MA have the potential for an increased incidence of injuries sustained during participation in these sports.

The most widely used classification of contact sports in the literature is from the American Academy of Pediatrics Committee on Sports Medicine,<sup>21</sup> in which MA activities are categorized into the subgroups of contact or limited contact sports. However, other authors prefer to consider MA as a separate group because of the high risk of injuries associated with these types of sports.<sup>1,23</sup> Regardless of the classification used, there is a lack of information in the literature regarding the arthroscopic management of anterior shoulder instability in athletes who participate in MA. Many forms of MA have evolved over the years, and recently, the MA field has become highly specialized and more violent.<sup>7</sup> Athletes purposely hit or collide with each other or with the ground repeatedly during a match or training with great force. Furthermore, many of the maneuvers used

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during fights expose the glenohumeral joint to its maximum capacity, which could not only compromise an athlete's return to sports but also have an impact on the percentage of recurrences.<sup>17,19,25</sup>

We hypothesized that because of their highly demanding activities, MA athletes who underwent arthroscopic stabilization would have a high percentage of recurrences, and many of them would not be able to return to sports at the same level as before their injury. The purpose of this study was to report the functional outcomes, return to sports, and recurrences in a series of MA athletes with anterior shoulder instability treated with arthroscopic stabilization.

## METHODS

A series of 24 consecutive MA athletes were treated for anterior shoulder instability at our institution between January 2008 and December 2013. Arthroscopic stabilization was performed in all patients. The ethics committee of our hospital approved this study (No. 00010193).

Inclusion criteria were MA athletes who had anterior shoulder instability and who participated at a competitive level (regular sport with competitions and practices  $\geq 2$  times/wk).<sup>23</sup> Exclusion criteria were large bony Bankart lesions (bony defect of  $>25\%$  on the anteroinferior portion of the glenoid), engaging Hill-Sachs lesions, humeral avulsions of the glenohumeral ligament, associated superior labral anterior and posterior (SLAP) lesions, associated posterior labral tears or rotator cuff injuries, previous surgery on the same shoulder, and patients with less than 36 months of follow-up.

## Evaluations

Preoperative and postoperative evaluations consisted of a patient-based questionnaire and a physical examination performed by a shoulder fellowship-trained physician who did not participate in the surgical procedure. Active and passive shoulder motion, including forward flexion, external rotation at the side, and internal rotation to the back, were measured preoperatively and at last follow-up. Before surgery, radiography and magnetic resonance imaging were performed in all patients. If, during these studies, bony defects were suspected, computed tomography was performed to evaluate the magnitude.

The Rowe score was used as a global outcome measure.<sup>22</sup> Additionally, a visual analog scale (VAS) was used to assess pain while performing shoulder sports (ranging from a maximum score of 10 to a minimum score of 0). Shoulder-dependent sports ability was measured by a 6-item questionnaire: the Athletic Shoulder Outcome Scoring System (ASOSS).<sup>16</sup> This questionnaire measures subjective sport-specific perception of pain, instability, muscular strength and endurance, intensity, and proficiency level, with each point graduated and compared with the time before injury (defined as 100%). Patients were examined at a minimum follow-up of 36 months. Patients were also asked if they could practice their previous sport and if they could perform it at the same level as before their injury. We divided postoperative sports activity levels into 5 grades according to

the classification of Cho et al<sup>6</sup> (grade 1: complete return to preinjury activity level; grade 2: near-return to preinjury activity level; grade 3: return to preinjury activity with moderate limitations; grade 4: return to preinjury activity with severe limitations; and grade 5: inability to return to preinjury activity with discomfort during daily activities). If patients sustained a recurrence and switched sports, we graded their activity level as the highest level that they had achieved before the recurrence. All surgery-related complications and reoperations were documented.

## Surgical Technique

The patient was placed in the lateral decubitus position. The arm was abducted 60° to 70° with forearm traction of 10 to 15 lb. We used a standard posterior portal with 2 anterior portals, and the flow of irrigation was maintained by an arthroscopic pump (40-60 mm Hg). Looking from the posterior portal, we evaluated the relation of the Hill-Sachs lesion with the anterior glenoid, reproducing the dislocated shoulder position. Moreover, a final evaluation of the glenoid bone defect was performed intraoperatively. The labral edge was debrided after complete liberation and release of the capsulolabral ligament beyond the 6-o'clock position. Then, the anterior and inferior glenoid rims and neck were lightly abraded with a shaver.

Multiple anchors with No. 2 nonabsorbable sutures were placed on the cartilage edge of the glenoid surface. The first one was placed in the inferior area of the anterior glenoid rim, below the 5-o'clock position. Typically, additional anchors were placed in a similar manner at both the 3- and 4-o'clock positions. Capsular plication was performed, starting 1 hour inferior to anchor placement and lateral depending on capsular laxity, between 5 and 15 mm, to create superior tensioning of the inferior glenohumeral ligament and eliminate inferior capsular redundancy. Once the sutures were placed in the correct position, they were secured with sliding knots.

## Postoperative Rehabilitation

The arm was supported with a sling for 4 weeks. All patients followed a standard postoperative rehabilitation protocol supervised by one of the authors (L.A.R.). After 1 week, supervised gentle physical therapy consisting of passive pendulum and gradual passive range of motion (ROM) exercises was begun. Active-assisted ROM exercises were started 2 weeks after surgery. When the patient could perform active forward elevation above the shoulder level, usually at 4 to 6 weeks after surgery, shoulder-strengthening exercises were started. Supervised rehabilitation continued for 3 months. Return to sports was allowed when the patient was pain free, full shoulder ROM had been achieved, and shoulder strength was near 100%, which usually occurred at 6 to 8 months.

## Statistical Analysis

The Wilcoxon signed-rank test was performed to assess the difference in preoperative and postoperative ROM

TABLE 1  
Patient Demographics

Variable	Value
No. of patients	20
Sex, male/female, n	16/4
Follow-up, mean (range), mo	71 (36-96)
Dominant involvement, n (%)	14 (70)
Age at time of surgery, mean (range), y	25.4 (18-35)
Type of sport, n	
Tae kwon do	7
Judo	6
Kickboxing	3
Karate	2
Jiu jitsu	2
Competitive level, n	20

measurements and shoulder scores. Statistical analysis was performed using the software STATA version 12 (StataCorp). A *P* value <.05 was considered statistically significant.

## RESULTS

From the 24 consecutive arthroscopic stabilization procedures performed in MA athletes during the study period, 4 patients were excluded from the study. Two patients had a bony defect of >25% that was treated with the Latarjet procedure, 1 patient had a concomitant rotator cuff tear that was repaired, and 1 patient had an engaging Hill-Sachs lesion that was treated with remplissage in addition to Bankart repair. No patient was lost to follow-up. The final evaluation was thus carried out in 20 patients. The mean age at the time of surgery was 25.4 years (range, 18-35 years), and the mean follow-up period was 71 months (range, 36-96 months). Patient demographic details are summarized in Table 1.

### ROM and Functional Scores

No significant difference in shoulder ROM was found between preoperatively and postoperatively (Table 2). The Rowe, VAS, and ASOSS scores showed statistical improvement after surgery (*P* < .01). Specifically, the mean Rowe score increased from 45.5 preoperatively to 94.0 postoperatively (*P* < .01). Subjective pain during sports improved from a mean score of 3.8 preoperatively to 1.3 at last follow-up (*P* < .01). The mean ASOSS score improved significantly from 48.0 preoperatively to 82.5 postoperatively (*P* < .01) (Table 2).

### Return to Sports

The mean time to return to sports was 6.4 months (range, 4-10 months). In all, 19 athletes (95%) returned to sports. According to the sports activity classification, 12 patients (60%) were rated as grade 1 or 2 after surgery (≥90% recovery), and 7 patients (35%) were rated as grade 3 or 4

TABLE 2  
Preoperative and Postoperative Scores  
and Range of Motion<sup>a</sup>

Variable	Preoperative	Postoperative
Rowe score	45.5 ± 5	94.0 ± 6
VAS score	3.8 ± 1	1.3 ± 1
ASSOS score	48.0 ± 8	82.5 ± 7
Forward flexion, deg	167 ± 8	170 ± 12
External rotation, deg	66 ± 7	60 ± 8
Internal rotation	T6	T7

<sup>a</sup>Values are expressed as mean ± SD unless otherwise indicated. ASOSS, Athletic Shoulder Outcome Scoring System; VAS, visual analog scale.

TABLE 3  
Classification of Sports Activity Levels<sup>a</sup>

Classification	n (%)
Grade 1	8 (40)
Grade 2	4 (20)
Grade 3	6 (30)
Grade 4	1 (5)
Grade 5	1 (5)

<sup>a</sup>Grade 1: complete return to preinjury activity level; grade 2: near return to preinjury activity level; grade 3: return to preinjury activity with moderate limitations; grade 4: return to preinjury activity with severe limitations; grade 5: inability to return to preinjury activity with discomfort during daily activities.

(moderate or severe limitations). One patient was not able to return to sports because of shoulder pain (Table 3).

### Postoperative Recurrences

The recurrence rate was 20% (4 patients). There were 3 redislocations (15%), and 1 patient (2.9%) suffered repetitive subluxations. Detailed information regarding recurrences is shown in Table 4.

### Complications

No intraoperative complications or infections were reported.

## DISCUSSION

Our hypothesis that MA athletes who underwent arthroscopic stabilization would have a high percentage of recurrences and that many of them would not be able to return to sports at the same level as before their injury was confirmed in this study. Although ROM and functional scores improved significantly postoperatively, only 60% of patients could return to the same level as before surgery, and there was a 20% recurrence rate at a mean follow-up of 71 months.

TABLE 4  
Recurrences

Patient (Type of Recurrence)	Type of Sport	Moment of First Recurrence, mo	Other Recurrences	Management	Changed Sport
Patient 1 (dislocation)	Judo	18	No	Latarjet (bone defect >20%)	Yes (soccer)
Patient 2 (dislocation)	Judo	12	No	Physical therapy	Yes (soccer)
Patient 3 (dislocation)	Tae kwon do	9	No	Physical therapy	Yes (running)
Patient 4 (subluxation)	Tae Kwon do	20	Multiple subluxations	Physical therapy	Yes (gymnastics)

Open stabilization with Bankart repair and anterior capsulorrhaphy is the historical gold standard for the treatment of anterior shoulder instability in athletes, with recurrence rates that range between 3.5% and 4%.<sup>2,22</sup> Advances in arthroscopic techniques have led to the more common use of arthroscopic procedures for shoulder stabilization. Two recent systematic reviews of long-term outcomes after open or arthroscopic Bankart shoulder stabilization showed no significant difference in recurrences of instability, return to sports, or postoperative osteoarthritis between the two techniques.<sup>5,11</sup> Some authors have advocated performing a bone block procedure as the index surgery for collision athletes. We are not aware of any studies that have reported on outcomes of bone block procedures in MA athletes.

Most authors have proposed classifying MA as contact or collision sports.<sup>1,20</sup> MA techniques can be simply broken down into 2 basic types: striking and grappling (which can include throws/takedowns, chokes, and joint locking).<sup>17</sup> Recently, mixed martial arts (MMA) has also become popular. MMA is a combination of different combative techniques, essentially striking, grappling, and submission maneuvers from different styles. The eradication of many restrictive and oftentimes confusing rules appears to be appealing to the general public. However, further research is needed to better understand the prevalence and profiles of injuries sustained in MA competitive events. Breaking down the MA techniques into basic concepts of striking, grappling, and submission maneuvers, including choking and joint locking, may facilitate the better understanding and management of injuries.

In a recent systematic review, Leroux et al<sup>13</sup> reported that the pooled failure rate across 26 studies reporting on outcomes after primary arthroscopic shoulder stabilization in contact or collision athletes was 17.8%. However, across studies using modern, evidence-based patient indications and surgical techniques, the failure rate was only 7.9%.<sup>13</sup> Unfortunately, there is considerable variability in the reporting of patient demographics, surgical indications, surgical techniques, and patient outcomes in the available studies.<sup>13,14</sup> Furthermore, no previous investigation has directly analyzed the results of arthroscopic stabilization in the high-risk subgroup of MA athletes. Although a few studies involved patients who practiced MA, the small number of patients evaluated and the fact that they were analyzed together with the rest of the collision athletes make it difficult to obtain specific conclusions about this subgroup.

Uchiyama et al<sup>24</sup> reported the largest study of operative results after open procedures for anterior shoulder

instability in 50 judokas. The recurrence rate was 5.8%. However, only 65% returned to preinjury activity levels.<sup>24</sup> Ide et al<sup>12</sup> reported that the recurrence rate in 21 contact athletes, including 6 judokas, was 9.5% (2/21) after an arthroscopic suture anchor technique, but the authors did not offer any details about the judokas. Rhee et al<sup>20</sup> compared the postoperative outcomes of arthroscopic repair and open Bankart repair in 13 judokas. The recurrence rate was 25.0% (1/4) in the arthroscopic repair group and 0% in the open Bankart repair group.<sup>20</sup> In our study, we found a 20% recurrence rate. All the recurrences occurred because of high-impact trauma with another fighter or with the ground during training or competition. Probably, until more evidence is available, the most convenient way to analyze MA and instability is to consider MA as a separate group. Otherwise, if we assume that the probabilities are the same as in contact sports, we may be underestimating the real risk.

One of the main expectations of athletes, whatever their age or level of play, is to return to sports after treatment if possible at the same level as before their injury. Despite favorable results in the general population, there are a lack of studies in the literature evaluating return to sports after arthroscopic anterior shoulder stabilization in MA athletes.<sup>8,10</sup> In our study, although the overall percentage of patients who returned to sports was high (95%), only 60% of the athletes had  $\geq 90\%$  recovery. Previous authors also reported similar results regarding return to sports in collision athletes.<sup>3,8,10</sup> This relatively large proportion of athletes who did not return to preinjury levels may reflect the fact that these patients are exposed to high-demand activities in which the glenohumeral joint requires maximum flexibility. Moreover, permanent impacts to the joint could also compromise performance. Petrera et al<sup>18</sup> reported a 73% rate of complete return to preinjury levels in 22 collision athletes. Cho et al<sup>6</sup> reported a 21.4% rate of complete return to preinjury levels in collision athletes, with only 57% of them returning to the same level with slight or moderate limitations.

Stein et al<sup>23</sup> were the only ones who reported information regarding return to sports in the subgroup of MA athletes. They prospectively evaluated shoulder sport-specific impairments after arthroscopic Bankart repair in 47 athletes. Patients were analyzed separately according to the sport: noncollision/nonoverhead (G1), collision (G2), overhead (G3), and MA (G4). Although they could only analyze 4 patients, 3 of them were unable to return to the same proficiency level, and another one had to change sports. Furthermore, MA athletes (G4) experienced significantly

longer periods of rehabilitation than the other groups. Those athletes who participated in sports that need more precision, load transfer, and endurance recovered significantly slower than those of the less shoulder function-dependent groups. Similar to our study, other authors also reported that athletes who participated in functionally demanding types of sports involving the shoulder demonstrated significantly inferior proficiency levels compared with those involved in less demanding activities.<sup>3,8,10</sup>

Although our indication to return to sports was when patients were pain free, full shoulder ROM had been achieved, and shoulder strength was near 100%, which usually occurred at 6 to 8 months, many patients returned earlier. However, we still maintain the same rehabilitation protocol, as we believe that we do not have sufficient evidence to allow athletes to return earlier to sports and because early return to sports may be a risk factor for recurrent instability.

Some limitations to this study should be mentioned. First, we did not have a control group and therefore could not compare the arthroscopic suture anchor stabilization technique directly with other methods, nonoperative treatments, or other sports. Second, the number of involved patients was small. Third, we did not record the number of episodes of instability before surgery. This number has been shown by some authors to affect outcomes.<sup>9</sup> Finally, there were different types of MA included, and the differences in techniques in each MA type could have influenced the results. However, we consider that our findings are particularly relevant given the limited data available in the literature on this topic.

## CONCLUSION

In this retrospective study of a consecutive cohort of MA athletes, anterior shoulder stabilization with suture anchors significantly improved functional scores. However, only 60% of the athletes achieved the same level of competition as before the surgery, and there was a 20% recurrence rate.

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