Lack of Consensus in Rehabilitation Protocols After Posterior Shoulder Stabilization

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Background: Posterior shoulder instability is being identified and treated more frequently by orthopaedic providers. After posterior shoulder stabilization, long-term outcomes in function and mobility are largely dependent on the postoperative rehabilitation period. Thus, it is important to assess the consistency between protocols at different institutions.

Purpose/Hypothesis: The purpose of this study was to investigate the variability among rehabilitation protocols published by academic orthopaedic programs and their affiliates. It was hypothesized that there would be little consistency in the duration of immobilization, timing of functional milestones, and start dates of various exercises.

Study Design: Cross-sectional study.

Methods: Rehabilitation protocols after posterior shoulder stabilization that were published online from Accreditation Council for Graduate Medical Education (ACGME)–accredited orthopaedic surgery programs and their affiliates were evaluated for recommendations on immobilization, exercises, activities, range of motion (ROM), and return-to-sport goals.

Results: Of the 204 ACGME-accredited orthopaedic surgery programs, 22 programs and 17 program affiliates had publicly available rehabilitation protocols that were included for review. There were 37 programs (94.9%) that recommended the use of sling immobilization for a mean of 4.7 ± 1.8 weeks postoperatively. Active ROM of the elbow, wrist, and hand was the most common early ROM exercise to be recommended (36 programs; 92.3%). The goal of 90° passive external rotation demonstrated the widest range of recommended start dates (0-12 weeks postoperatively). Late ROM exercises and start dates varied between protocols, with the largest standard deviation found in achieving full active ROM (13.5 ± 3.6 weeks). Resistance exercises showed a wide range of recommended start dates. Bench presses and push-ups began, on average, at 13.1 ± 3.4 and 15.3 ± 3.2 weeks, respectively. Return to sport was recommended at 21.7 ± 3.6 weeks.

Conclusion: There was a high level of variability in postoperative rehabilitation protocols after posterior shoulder stabilization among orthopaedic programs and their affiliates, suggesting that a standard protocol for rehabilitation has yet to be established.

Keywords: posterior shoulder instability; posterior shoulder stabilization; rehabilitation; physical therapy

Posterior shoulder instability (PSI) is becoming increasingly recognized by orthopaedic providers and poses a challenging problem for both patients and surgeons. Previous studies have demonstrated PSI to be less common compared to anterior shoulder instability, accounting for only 2% to 10% of all instability cases.[4,16,19,21] However, PSI is likely frequently missed because of an insidious presentation with deep posterior shoulder pain and weakness rather than occult or subjective feelings of an unstable shoulder, as is observed with anterior instability.[19] As imaging modalities and our understanding of PSI have improved, it is more frequently diagnosed and treated. A 2018 study from the Multicenter Orthopaedic Outcomes Network (MOON) group reported that posterior instability accounted for 23% of shoulder instability diagnoses.[10] Relatively higher rates of PSI and combined anterior-posterior instability have also been reported in young active populations, such as professional athletes and cadets at the United States Military Academy.[2,11,18,22] First-line treatment generally entails nonoperative management including activity modification and physical therapy. However, an operative intervention is frequently required in patients experiencing recurrent instability, which has been found to occur in 17.7% of patients within the first year after an injury.[17] A study by Woodmass et al[21] in 2019 showed that the prevalence of

The Orthopaedic Journal of Sports Medicine, 11(5), 23259671231161589
DOI: 10.1177/23259671231161589

a surgical intervention since 1996 increased from 53.1% to 87.5%.

Various operative procedures have been described for the management of PSI, ranging from arthroscopic stabilization to open stabilization with capsular shift and osteotomy or a bone block procedure. However, with advances in arthroscopic technology and techniques in recent years, there has been a shift away from open procedures toward arthroscopic stabilization.[12] Arthroscopic posterior stabilization procedures have been shown to provide low rates of recurrent instability as well as greater than 90% of patients reporting successful return to sport (RTS).[7,13,15] However, when discussing patient-reported outcomes, as well as the timing and ability for patients to return to presurgical activity levels, postoperative rehabilitation is an equally important variable. Unfortunately, to date, there is little high-quality evidence supporting a "gold-standard" rehabilitation protocol. In contrast to anterior instability in which the American Society of Shoulder and Elbow Therapists has released a consensus statement related to rehabilitation guidelines after arthroscopic stabilization,[9] a similar statement for PSI does not exist. This discrepancy is likely related to the low prevalence of PSI and the more recent surge in arthroscopic stabilization for patients presenting with PSI.[12]

Given the importance of postoperative rehabilitation after stabilization in patients with PSI, it is imperative to establish consistent evidence-based rehabilitation protocols that can be adopted for use by a general physical therapist. It is unclear if variability exists among providers' and institutions' postoperative PSI protocols. DeFroda et al[6] have demonstrated significant variability in rehabilitation protocols prescribed after arthroscopic Bankart repair at various academic institutions, which may lead to worse outcomes and confusion among patients and providers.

In this study, we aimed to investigate the variability among rehabilitation protocols after posterior shoulder stabilization published by academic orthopaedic programs. We hypothesized that there would be little consistency among the various protocols in the duration of immobilization, timing of functional milestones, and start dates of various exercises.

METHODS

A list of academic orthopaedic surgery institutions was obtained from the Accreditation Council for Graduate Medical Education (ACGME) website,[1] and a search engine (Google) was used to identify any rehabilitation protocols affiliated with the orthopaedic surgery department for a given academic program. This included any private practice or hospital affiliates of the program. The search term was "[program/hospital affiliate/medical school affiliate/physician affiliate] posterior shoulder instability/posterior shoulder stabilization/posterior bankart/reverse bankart/posterior capsulorrhaphy/posterior labral repair rehabilitation protocol." Protocols were excluded if they did not specify one of the aforementioned procedure types or the affiliate did not specify the ACGME-accredited program on its website. A single researcher (S.D.) reviewed the publicly available physical therapy rehabilitation protocols from ACGME-accredited academic orthopaedic surgery programs and their affiliates to ensure consistency in the analysis process.

All rehabilitation protocols acquired were assessed for various components of rehabilitation, including immobilization, range of motion (ROM), and exercises. The protocols were categorized as follows: postoperative adjunct therapy; early ROM exercises, start dates, and goals; passive ROM exercises, start dates, and goals; late ROM exercises, start dates, and goals; resistance/strengthening exercises, start dates, and goals; and sport-specific activities, start dates, and goals. A complete list of reviewed metrics is available in Table 1. Information regarding rehabilitation protocols was recorded and analyzed in Excel (Microsoft). The primary goal of this study was to determine the inclusion or exclusion of therapies and exercises as well as start dates and goals of the various rehabilitation activities.

RESULTS

Among the 204 ACGME-accredited programs reviewed, 22 programs and 17 program affiliates had publicly available rehabilitation protocols, with 39 total protocols available and included for review.

Postoperative Adjunct Therapy

Of the 39 rehabilitation protocols, 37 (94.9%) recommended the use of a sling postoperatively, and 11 (28.2%) recommended additional equipment, such as an external rotation brace or pillow. The mean length of time in a sling for all protocols was 4.7 weeks. There were 26 programs (66.7%) that recommended the use of ice postoperatively.

Early ROM Exercises

Exercises recommended in the immediate postoperative period varied among protocols and consisted mainly of low-impact movements and stretches. Active ROM of the

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Final revision submitted December 5, 2022; accepted January 19, 2023.

One or more of the authors has declared the following potential conflict of interest or source of funding: B.D.O. has received consulting fees from DePuy, Linvatec, Musculoskeletal Transplant Foundation, and Vericel; has received royalties from Linvatec; has received honoraria from Vericel; and is a paid associate editor of *The American Journal of Sports Medicine*. AOSSM checks author disclosures against the Open Payments Database (OPD). AOSSM has not conducted an independent investigation on the OPD and disclaims any liability or responsibility relating thereto.

Ethical approval was not sought for the present study.

TABLE 1
Rehabilitation Recommendations[a]

Postoperative adjunct therapy	Immobilization with sling, external rotation brace, or pillow
Early ROM exercises	Active ROM of elbow/wrist/hand, pendulum, scapular elevation, scapular retraction, supine external rotation, supine forward elevation, hand-gripping exercises, active ROM of cervical spine
Passive ROM exercises	Passive forward flexion, passive external rotation, passive internal rotation, full passive ROM
Late ROM exercises	Full active ROM, scapular stabilization, serratus punches, normal scapulothoracic motion, isotonic resistance, deltoid isometrics, submaximal isometrics
Resistance/strengthening exercises	Band/tube training, light resistance, resisted internal and external rotation, light biceps curls, closed chain training, push-ups, plyometrics, dumbbells/free weights, lateral pulldowns, bench presses
Sport-specific activities	Aquatic therapy, jogging, running, stationary bicycle, treadmill walking, StairMaster, swimming, upper body ergometer, sport-specific activity (nonoverhead), overhead sport activity, throwing from mound, return to sport

[a]ROM, range of motion.

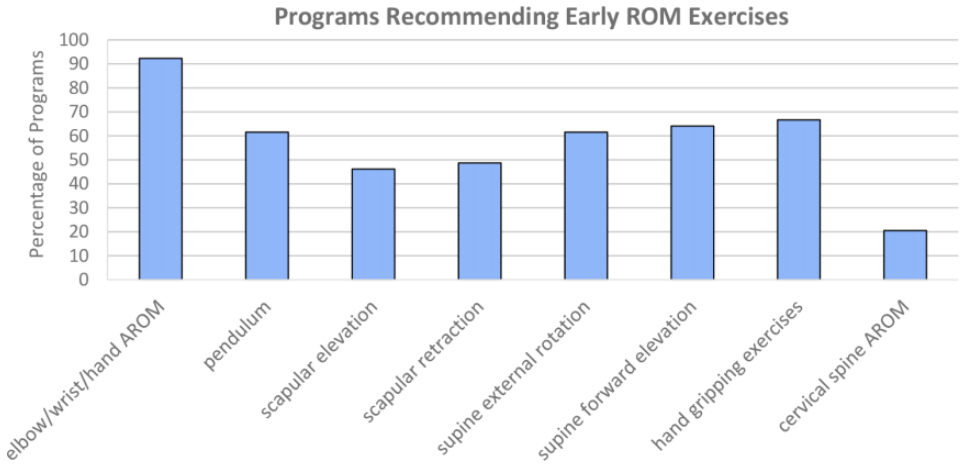

Figure 1. Percentage of programs recommending specific exercises in the early postoperative period. AROM, active range of motion; ROM, range of motion.

elbow, wrist, and hand was most often recommended (36 programs; 92.3%), followed by hand-gripping exercises (26 programs; 66.7%) (Figure 1). Supine forward elevation was recommended by 25 programs (64.1%), and supine external rotation was recommended by 24 programs (61.5%). The exercise that was least likely to be recommended was active ROM of the cervical spine (8 programs; 20.5%).

Passive ROM Exercises

Among protocols, there was a large range in recommendations for reaching full passive ROM as well as high variability in the timeline for incremental ROM goals. The goal of 90° passive external rotation demonstrated the widest range in expected start dates from 0 to 12 weeks postoperatively (Figure 2). The goal of 90° passive forward flexion averaged 2.0 ± 1.9 weeks, and the goal of 160° passive forward flexion averaged 7.4 ± 3.2 weeks. Passive internal rotation was the last movement to begin, with the goal of 30° averaging 5.3 ± 2.3 weeks postoperatively. There were 12 protocols (30.8%) that did not recommend internal rotation until ≥6 weeks postoperatively. Full passive ROM was recommended to be achieved at 10.8 ± 1.9 weeks.

Late ROM Exercises

There were a variety of exercises recommended during the later weeks of postoperative therapy, including active ROM, scapular stabilization, serratus punches, normal scapulothoracic motion, isotonic resistance, deltoid isometrics, and submaximal isometrics. The most recommended exercises were isotonic resistance (37 programs; 94.9%), scapular stabilization (34 programs; 87.2%), and submaximal isometrics (33 programs; 84.6%) (Figure 3A). Protocols varied in their start dates of these activities. Recommendations for starting active ROM and achieving full active ROM were given by 37 programs (94.9%). Active ROM was recommended to begin, on average, at 5.3 ± 1.4 weeks and to achieve full active ROM by 13.5 ± 3.6 weeks postoperatively (Figure 3B). Achieving full active ROM also had the largest range in recommended start dates, from 9 to 28 weeks postoperatively, among the protocols.

Resistance/Strengthening Exercises

Resistance/strengthening exercises varied among protocols, with 10 different movements most often included. The

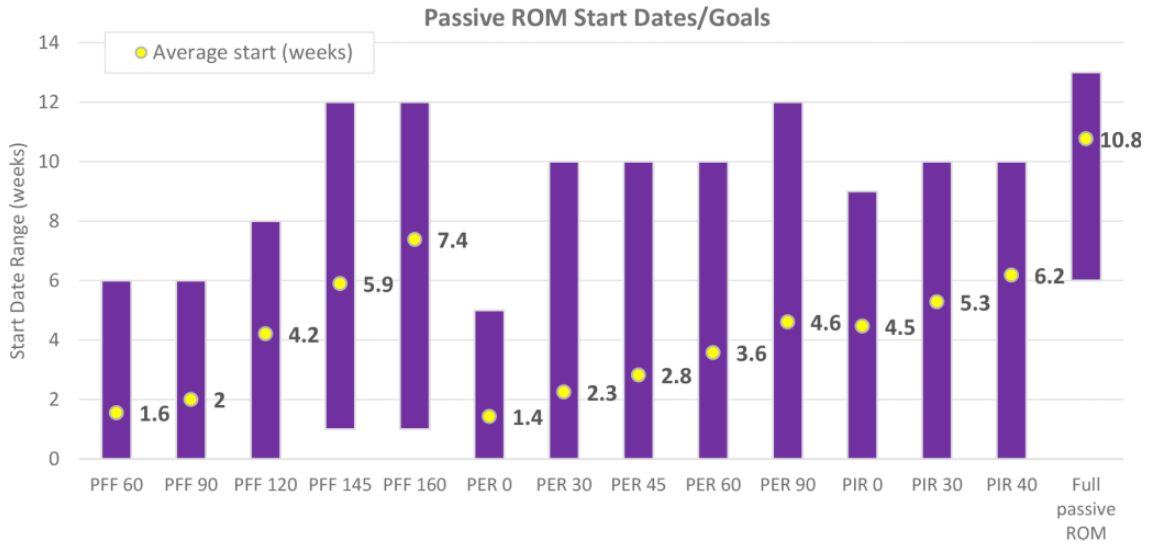

Figure 2. Mean and range of start dates in weeks recommended by programs for passive ROM in the postoperative period. PER, passive external rotation; PFF, passive forward flexion; PIR, passive internal rotation; ROM, range of motion.

most recommended activities were light resistance (37 programs; 94.9%), band or tube training (28 programs; 71.8%), and closed-chain training (28 programs; 71.8%) (Figure 4A). Start dates varied by activity, with all resistance or strength training beginning, on average, at ≥6 weeks postoperatively. Bench presses and lateral pull-downs were recommended to begin at 13.1 ± 3.4 and 14.1 ± 5.6 weeks, on average, respectively (Figure 4B). Push-ups were, on average, the last exercise to be introduced at 15.3 ± 3.2 weeks.

Sport-Specific Activities

Sport-specific activities demonstrated the most variation in recommendations, consisting of various exercises, sport activities in a controlled environment (ie, throwing from the mound), and guidance on graded RTS. These activities most often came at the end of protocols as the last step toward full recovery and RTS or return to an active daily lifestyle. Sport-specific activities were most recommended (28 programs; 71.8%), followed by overhead sport activities (24 programs; 61.5%) (Figure 5A). Walking on a treadmill and using the StairMaster were the first sport-specific activities to be introduced at 4.5 ± 1.0 and 6.2 ± 0.4 weeks, respectively (Figure 5B). There were 22 programs (56.4%) that gave recommendations on when to RTS, averaging 21.7 ± 3.6 weeks postoperatively. Throwing from the mound was, on average, the last activity to be recommended at 28.0 ± 9.8 weeks.

DISCUSSION

The most significant finding in our study was the large variability that existed in the postoperative rehabilitation protocols after posterior shoulder stabilization among ACGME-accredited orthopaedic surgery programs. The fact that no commonly agreed protocol exists for postoperative therapy after this type of surgery can create confusion and the potential for inferior outcomes. Interestingly, the standardization of care has been shown to lead to improved quality of care and efficiency in other areas of orthopaedic surgery.[3,20] As so many protocols exist with such differing restrictions, goals, and preferences, it is imperative that further work clarifies which rehabilitation strategies lead to the best outcomes for patients who undergo posterior shoulder stabilization.

The largest variability that existed among the protocols was found in the start dates and goals for both passive and active ROM of the shoulder. For instance, the range for achieving 90° passive external rotation was 0 to 12 weeks, and the range for achieving full active ROM was 9 to 28 weeks, with a mean of 13.5 weeks. Furthermore, only 12 of the 39 protocols restricted internal rotation for the first 6 weeks of the postoperative period. These inconsistencies can obviously lead to misunderstandings among patients and members of their care teams, such as physical therapists. The extent of this variety in important postoperative benchmarks begs the question of how much protocol differences truly influence outcomes; this question has not been examined much, if at all, in the current literature. Finally, confusion among patients and their care teams also may arise because of the vagueness of some protocols. For example, rehabilitation that allows only "light resistance" does not further specify any weight restrictions. Other protocols give very wide time ranges to initiate certain ROMs or specific exercises. As each patient progresses through rehabilitation individually, it is understandable why time frames are used instead of specific time points, but the large variability among these time frames for certain exercises can make it difficult to evaluate if patients are progressing appropriately. For instance, while one protocol encourages dumbbell and free weight workouts as early as 4 weeks, another protocol does not encourage this activity until

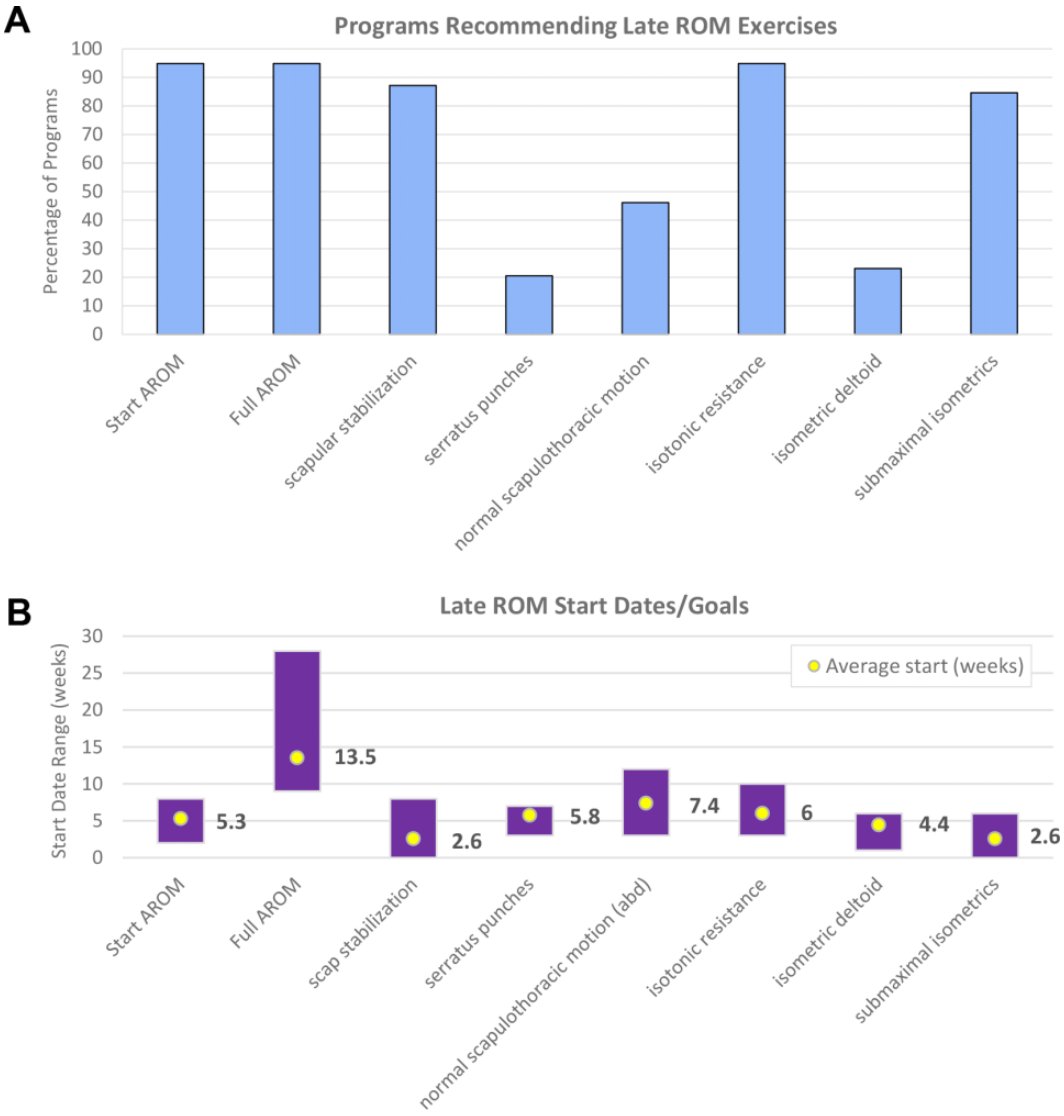

Figure 3. (A) Percentage of programs recommending specific exercises in the late postoperative period. (B) Mean and range of start dates in weeks recommended for late ROM activities. AROM, active range of motion; ROM, range of motion.

24 weeks postoperatively. This difference of 20 weeks can make it very difficult, from a provider viewpoint, to assess a patient's adequate progression and therefore recovery.

For athletes, RTS is an important goal after posterior shoulder stabilization. In the protocols examined in this study, sport-specific activities widely varied. Only 22 of the 39 protocols (56.4%) gave specific recommendations for the timing of RTS, with a wide range from 16 to 28 weeks. A recent systematic review that evaluated the rates of and time to RTS found a similar range from 4.3 to 7.7 months.[14] This variability in the time to RTS could be influenced by the different demands on the shoulder based on the type of sport, but it also reflects the absence of a consensus for a rehabilitation protocol after posterior shoulder stabilization. While some studies have compared rehabilitation protocols and examined the difference in outcomes and RTS after anterior shoulder stabilization,[5,6] the literature for posterior shoulder stabilization is comparatively lacking. Interestingly, criteria-based RTS testing showed lower rates of recurrent instability after arthroscopic Bankart repair, emphasizing that time-based return protocols may not be as effective.[8] Although athletes, coaches, and therapists like to envision RTS from a time perspective, it is important to remember that all patients progress uniquely, and specific criteria may be more helpful to determine a patient's readiness to return to activity. In the protocols that we reviewed, only 16 protocols (41.0%) included criteria-based RTS measures in addition to time-based recommendations, which magnify the need for further work to standardize postoperative rehabilitation for patients who undergo posterior shoulder stabilization.

Our study did find a few points of consistency among the protocols that were included. Nearly all of the protocols (92.3%) recommended early active ROM of the elbow, wrist,

Figure 4. (A) Percentage of programs recommending exercises specific for resistance and strength training in the postoperative period. (B) Mean and range of start dates in weeks recommended for resistance and strength activities. ER, external rotation; IR, internal rotation; lat, lateral.

and hand to prevent stiffness of these nonoperative joints after surgery. Additionally, all of the protocols restricted or did not expect patients to achieve full passive ROM of the shoulder during the first 6 weeks. Finally, almost all of the protocols (94.9%) recommended late active ROM of the shoulder, suggesting that a consensus may exist for a brief period of immobilization after surgery. These similarities in therapy can be used as a starting point to help clarify specific standards for more consistent PSI rehabilitation.

Limitations

One limitation of this study was that among the 204 ACGME-accredited academic programs and their affiliates that were evaluated, only 29 programs (14.2%) had specific rehabilitation protocols (39 protocols total) for posterior shoulder stabilization. This finding is likely explained by the fact that a consensus does not exist for rehabilitation after posterior shoulder stabilization. The majority of programs do not appear to support 1 specific protocol. Additionally, the protocols collected were not all specific to arthroscopic repair and therefore included protocols that did not specify either arthroscopic or open surgical repair. This may have affected the rehabilitation recommendations of these protocols. As mentioned previously, our study also evaluated protocols that were published by affiliates of academic programs. These affiliates may not be closely associated with the academic programs, so it is important to note that even among these groups, there is likely variability among surgeons for the rehabilitation of their patients after posterior shoulder stabilization. Next, some of the protocols included in this study were designed for specific types of athletes, making them less generalizable for all patients with PSI. Other protocols included in the study were vague in their recommendations, making comparisons with other protocols difficult. Finally, not all surgeons from an institution may adhere to the specific protocol published by their program, as they may adjust for patient-specific factors or personal preference.

Ultimately, this study confirms that there exists a large variability among rehabilitation protocols after posterior shoulder stabilization. There is a need for clearer and more consistent rehabilitation guidelines after this procedure to help guide clinicians in their clinical decision-making postoperatively. Specifically, recommended start dates and

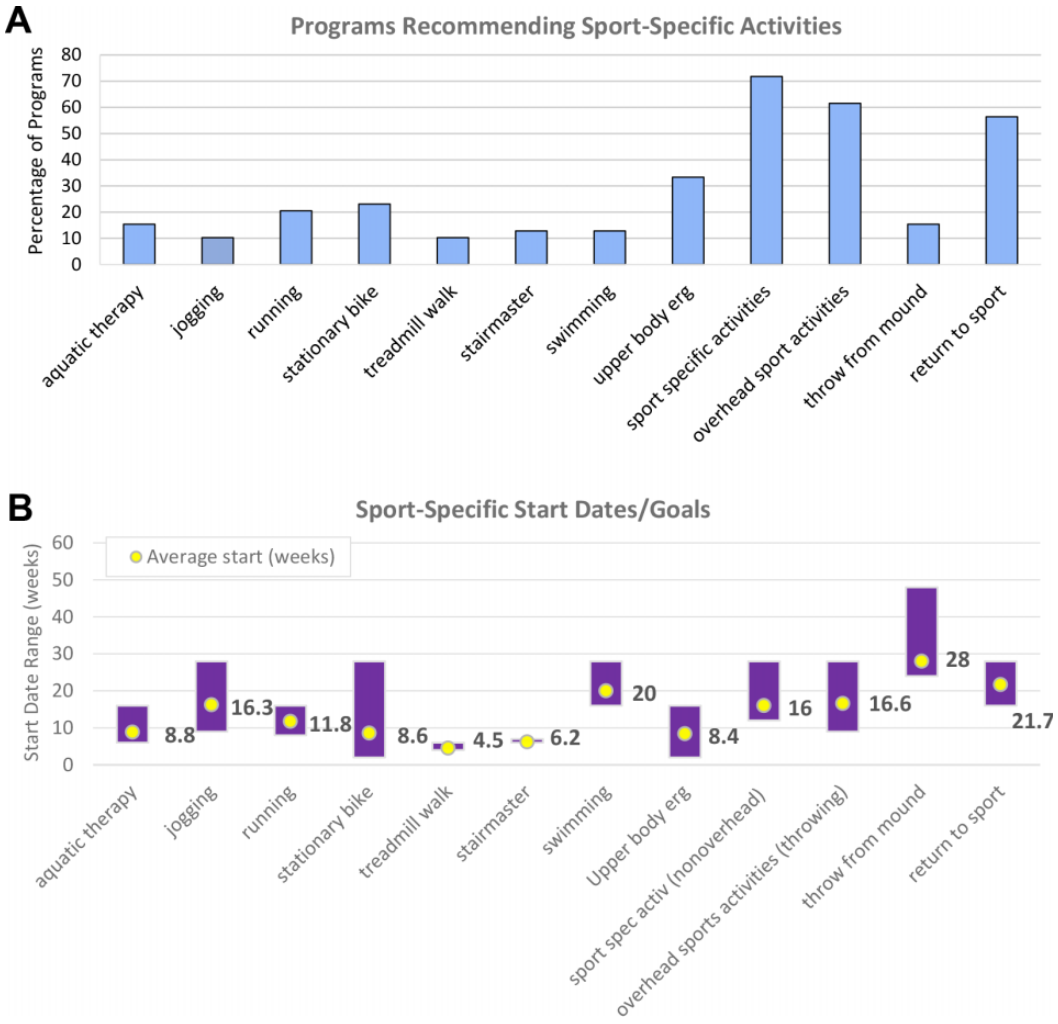

Figure 5. (A) Percentage of programs recommending sport-specific activities in the postoperative period. (B) Mean and range of start dates in weeks recommended for sport-specific activities. Erg, ergometer; spec active, specific activity.

goals for passive ROM, resistance/strengthening exercises, and RTS activities are areas with the greatest inconsistencies and could benefit most from standardization. Studies in the future should examine differences in outcomes based on different rehabilitation protocols to help clarify which factors lead to the best results.

CONCLUSION

The lack of consistency found among rehabilitation protocols across orthopaedic programs and their affiliates suggests that a gold standard for rehabilitation has yet to be established for posterior shoulder stabilization. With the postoperative period being a critical component for successful recovery after posterior shoulder stabilization, the variability in these protocols reveals an opportunity to improve outcomes through the standardization of postoperative recommendations.

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