Rehabilitation Postsurgical Stabilization for Shoulder Instability

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Abstract

The shoulder joint is a polyaxial joint with the advantage of increased mobility at the cost of stability. The incidence of subluxation/dislocation is on the increase considering the fact that children are more actively involved in sporting activities at a very young age. This has necessitated the orthopedic surgeons to identify those at risk of injuries as well as to treat those with injuries to restore normality without compromising the function. Over the recent past, surgical management for shoulder instability has evolved to a more precise level giving importance to the minutest details in respecting and repairing the injured structures. As a result of which the patient's recovery and functional outcome has been better than how it was earlier. Nonetheless, the success of surgery depends not only on the surgeon or the patient factors but also in the implementation of a tailored rehabilitation protocol focusing on getting the patient back to normalcy at the earliest with minimal discomfort. The aim of this article is to kindle the various aspects of an ideal rehabilitation following surgical stabilization of shoulder instability and to guide in the optimizing treatment protocol.

Keywords: Shoulder instability, Rehabilitation, Proprioception, Kinetic chain.

Introduction

Introduction

Shoulder joint is the most mobile joint in the human body [1]. It comprises of three true joints and one pseudo joint, namely the glenohumeral, acromioclavicular, sternoclavicular and scapulathoracic. The glenohumeral joint mobility is determined primarily by the static and dynamic stabilizers, as well as by the other three joints. The shoulder joint stability is a product of a fine interplay between the static and dynamic stabilizers. The bony configuration of the proximal humerus and glenoid contribute to the stability. But essentially, in the absence of bony stability, the glenohumeral joint stability is provided by the capsuloligamentous structure, synchronous coordination between the rotator cuff, deltoid and scapular muscle groups [2]. The configuration of the articular surface, glenoid labrum, intraarticular pressure, and dynamic stabilizers plays a crucial role in stabilization at mid-range of motion (ROM) [3]. The prime dynamic stabilization by the muscles is concavity compression, barrier effect, and passive tension [4]. Instability is defined as a clinical syndrome that occurs when shoulder laxity produces pain or a sense of displacement. The pathology of shoulder instability can be classified as structural (capsulolabral complex, rotator cuff, surface contact area) and non-structural (central and peripheral nervous system). The structural component can occur due to repetitive micro-traumatic events, single macro-traumatic event or congenital abnormality. This concept of instability has been classified a combination of structural and neurological elements by Stanmore et al. 90% of shoulder dislocation occurs due to a traumatic event and 4% due to repetitive minor injury. It is vital to consider the essential risk factors for recurrent instability which includes young age (<25 years), anterior glenoid and posterior humeral bone loss, multidirectional instability and prior ipsilateral shoulder dislocation [5, 6, 7, 8, 9, 10, 11]. The incidence of recurrent instability was 87% in patients aged <20years and 74% between 21 and 25 years after 5years from the time of primary dislocation [12], which dropped further to about 30% for patients aged more than 30 years. It is crucial for the glenohumeral joint to have a balance between the dynamic and static stabilizers and it is found that the anteroinferiorcapsulolabral avulsion, often termed as Bankart lesion is the most common injury following an anterior shoulder dislocation [13]. Hill-Sachs defect is another essential lesion that occurs due to impaction on the posterosuperior humeral head due to contact with the anteroinferior glenoid, which is known to occur in approximately 80% of initial dislocations and upto 100% in recurrent instability [14, 15, 16]. 22% of initial dislocators are known to have glenoid bony defect [14] and this percentage is known to increase upto 90% in recurrent instability [8, 17, 18]. Quantifying the extent of glenoid and humeral head, bone loss is mandatory is optimizing the treatment strategy. Sugaya et al. [19] in a sample of 100 consecutive computed tomography scans, found out that 10% patients had normal glenoid, 50% had true bony lesion, and 40% had some

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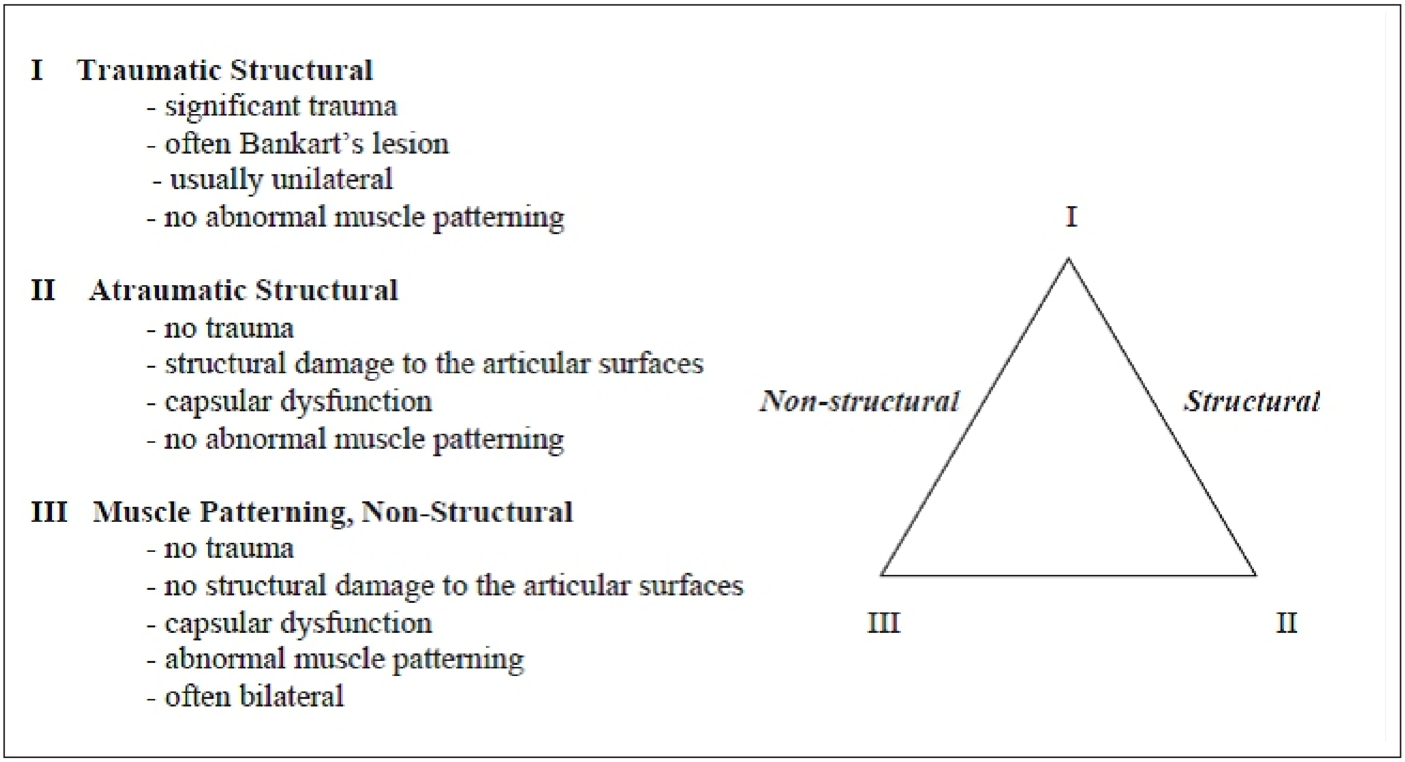

degree of bony erosion. Similarly, Itoi et al. [8] study on the relationship between instability and anterior glenoid loss revealed that the stability decreases as the degree of bone loss increased, most notably with a defect more than 21%. Mologneet al. [20] found that 50% of glenoids had some erosive bone loss without fracture fragments visible at a mean of 15 months after a primary traumatic dislocation.

A conservative management is prudent to be effective for voluntary dislocators or those with a non-structural cause (central nervous system [CNS] or peripheral nervous system), significant comorbidities contraindicated for surgery and those who may be deemed unable to be compliant with postoperative rehabilitation. Those who fail conservative approach and have associated rotator cuff, or capsulo-labral pathology should be considered for surgery.

The aim of this article is to enlighten the beneficial effects of an effective rehabilitation protocol following surgical stabilization of shoulder instability and to highlight the currents trends in optimizing the functional outcome.

The essential elements of rotator cuff rehabilitation can be broadly classified into preoperative elements and peroperative/postoperative elements. The principle of rehabilitation is not only just focusing on post-operative status but also to assess the patient preoperatively and put forth a roadmap to focus on the most vital component of the shoulder that needs specific attention, which if left unattended may compromise the functional outcome. This includes assessing the upper and lower quadrant flexibility, scapula control, rotator cuff recruitment, core stability/kinetic chain, proprioception, and ligamentous laxity. The postoperative elements of consideration include healing aid, type of instability, surgical procedure, dynamic stabilizer facilitation, proprioception, kinetic chain stabilization, and functional training.

Healing aid

The basic science of healing can be divided into the initial inflammatory stage which lasts for 1-3 days, followed by tissue repair phase or the proliferative stage usually lasting about 3-20 days and at last the collagen remodeling stage (21-60 days) where the scar tissue becomes progressively stronger and responsive to remodeling. Final maturation of the collagen tissue may take upto 360 days. During the first 3weeks after surgery, the repair site can only handle minimal stress due to weak collagen bonding. Hence, the initial phase of rehabilitation is designed to relieve pain and inflammation, improve the endurance of scapula-thoracic musculature and prevent complication (Table 1) (Fig 1). Some patients may show heightened inflammatory response inciting pain and stiff joint, whereas others may not. Hence, it is the utmost duty of the surgeon and therapist to modify the rehab protocol based on the quality of the endpoint, progression of pain. Pain control is the supreme objective during the initial phase. Nociception results are an alteration in patterns of muscle activation and recruitment, neuronal control mechanisms and local muscle morphology [21]. Hence, pain compromises the proprioceptive acuity and alters the postural control mechanisms [21], which may lead to poor patient compliance during rehabilitation and most importantly patient may adopt a compensatory movement pattern to avoid the pain that would be detrimental for proper muscle conditioning during the second phase of rehabilitation. Adopting a safe position of immobilization is essential, to minimize pain and maintain optimum tension in the healing tissue (Fig 1). Itoi et al.[22] had suggested that in case of a first time dislocator, it would be advantageous to immobilize the arm in 10°of external rotation which would allow better adaptation of the capsule-labral lesion to the glenoid resulting in optimum healing

Group	Glenoid defect (%)	Hill-Sach'sdefect	Recommended treatment
1	<25	On track	Arthroscopic Bankartrepair
2	<25	Off track	Arthroscopic Bankartrepair plus remplissage
3	>25	On track	Latarjet procedure
4	>25	Off track	Latarjet procedure with or without humeral sided procedure (humeral bone graft or remplissage)

and low rates of recurrence in long-term. This 10° of external rotation was supported by Miller et al.[23], who revealed that there was a positive contact force leading to higher healing rate in the human cadaveric model. However, there is a lack of evidence that if positioning in the external rotation may help the healing tissue post-operatively. Indeed this may also hamper the healing of biceps labral complex if it was repaired due to the so-called "peel back effect." Hence, for patients with Bankart repair with or without infraspinatus capsulotenodesis, bony stabilization procedures (bristow-latarjet) immobilization in internal rotation is considered universal, but it may be appropriate to select specific patients that will benefit from particular immobilization positions. Another critical factor is the length of immobilization. Usually, it ranges from 2 to 6 weeks (Table 1) depending upon the quality tissue available for repair, type of repair, number of suture anchors used (for Bankart repair). Kim et al. [1] demonstrated that patients undergoing accelerated rehabilitation resumed functional movements faster, returned to functional level of activity earlier with decreased postoperative pain and higher satisfaction. The most vital factors to be considered for an accelerated rehabilitation is the quality of tissue and its repair and communication between the surgeon and therapist, physician and therapist interaction is crucial in determining the safe zone of mobilization according to the capsular end-feel, which can be initiated during the initial phase so as to prevent joint stiffness without inciting pain and hampering the tissue repair. It is understood that beyond 3weeks of repair, the collagen tissue becomes strong enough and responsive to remodeling. Hence, a safe zone of mobilization (Table 1) can be started until the collagen becomes reasonably stronger (i.e. 3 weeks) beyond which the ROM can be gradually increased to facilitate quality tissue remodeling without inducing severe pain or inflammation. Educating the patients preoperatively regarding the type and position of immobilization will train them to avoid compensatory malposition of the operated limb which might be troublesome for a good rehabilitation.

Type of instability

The Bayley's triangle has guided us in categorizing patients with instability due to structural component who will benefit from surgery, those with non-structural component who are primary candidates for rehabilitation.

It has thrown light upon muscle patterning which refers to inappropriate recruitment, commonly the torque producing muscles of the glenohumeral joint, resulting in uncontrolled translation, and often dislocation/subluxation [24]. Unrecognized muscle patterning is a cause for surgical failure [25]. Therefore, muscle patterning should primarily be treated with physiotherapy, and in the absence of structural component for instability, surgery is contraindicated, whereas in patients with a structural component, it is mandatory to rule out any muscle patterning before any operative procedure is carried out so as to avoid undue failure postsurgery. Patients with a lax shoulder (as in non-habitual multidirectional instability) are to be treated

Table 1: Early phase (lasts from 0 weeks to 4 weeks)

Aim	Physiotherapy protocol
Pain control and reduction of swelling	Cryotherapy, analgesics, immobilization (preferably internal rotation), electrical simulation
Mobilization – in coordination with the surgeon (determine the safe zone of ROM)	Sling for 3 weeks to aid tissue healing Passive/active assisted forward flexion in plane of scapula with set limits Passive/active assisted ER in plane of scapula with set limits Pendulum if pain is tolerable
Strengthening (usually 5 × 10 repetitions, twice a day)	Isometric shoulder flexion, extension, abduction, ER, IR Shoulder shrugs Scapular protraction and retraction Elbow curls and extensions Wrist curls and extensions Grip strengthening Isometric core strengthening Lower limb weights training within limits
Cardiovascular fitness (every day)	Recumbant cycling (15-30 min) Walking (15-30 min)

ROM: Range of motion, IR: Internal rotation, ER: External rotation

Table 2: Intermediate phase (lasts from 4 to 8 weeks)

Aim	Physiotherapy protocol
Mobilization (in coordination with the surgeon)	Passive ROM until a clear end point without aggravating pain Pendulum exercise Active wall climbing facing the wall and in side standing posture Active assisted ROM in all directions as tolerated - use of sticks for assistance ROM started in supine position, gradually elevated to 45° recumbent position and finally to high sitting posture
Strengthening (usually 5 × 10 repetitions, twice a day)	Resistance band training until complete ROM is achieved without pain or limitation Gradually increase the resistance Strengthening in sequence starting from neck, peri-scapular muscles and shoulder muscles proper Core strengthening Weights training for lower quadrant musculature
Cardiovascular fitness	Recumbant cycling (30 min) Brisk walking (30 min) Step ups (15 min)

ROM: Range of motion

Figure 1: Early phase 0-4weeks: 1- Ideal position of immobilization (Internal rotation), 2- finger grip strengthening exercise, 3- Wrist curls exercise, 4- Elbow curls exercise, 5- shoulder shrug exercise, 6 - (a)Scapular retraction exercise, (b)Scapular protraction exercise, 7- Passive/active assisted arm flexion (within safe zone or mobility), 8 - (a)Isometric shoulder flexion, (b)isometric shoulder extension, (c)isometric shoulder abduction, (d)isometric shoulder internal rotation, (e)isometric shoulder external rotation.

Figure 2: Intermediate phase 4-8 weeks: 1 - (a)Activeabduction, (b)active external rotation, 2 - (a)Active assisted flexion, (b)active assisted abduction, (c)active assisted external rotation, (d)active assisted internal rotation, 3 - (a) forward wall climbing (for range of motion [ROM] as well as proprioception), (b and c) sideways wall climbing (for ROM as well as proprioception), 4 -Pendulum exercise.

Figure 3: Active phase 8weeks and beyond: 1 - (a)Resistance band muscle strengthening for external rotators, (b)resistance band muscle strengthening for internal rotators, (c)resistance band muscle strengthening for shoulder extensors, (d)resistance band muscle strengthening for shoulder adductors, 2 - (a) Increased resistance band muscle training for shoulder abductors, (b) increased resistance band muscle training for shoulder flexors, 3 - (a-c) Increased resistance band muscle training for periscapular muscles, 4 - (a-c) Swiss ball supported training for periscapular muscles (to create an unstable platform which helps training the proprioception, improves in conditioning the core as well as the lower quadrant muscles), (d) periscapular weight training on a stable platform, 5 - (a-c)Gradual increase in weights and overhead training to recreate a functional pattern in the training.

Figure 4: Functional training: Training on core, proprioception, and plyometrics. 1 -Push ups with ball (for proprioception, core strengthening), 2 - (a)Wobble board pushups, (b)wobble board single arm planks, 3 - (a)Wobble board planks (core strengthening), (b)Bosu ball plank (for core strengthening), 4 - (a-c)Bosu ball functional training (functional rehab as well as core stabilization), 5 - (a-c)and 6 (a and b)-plyometricsfor shoulder, 7 and 8 - Functional training on unstable platform (for core strengthening and proprioception).

primarily through conservative measures with rotator cuff strengthening, scapula thoracic muscle training, and methods to improve the proprioception. Those patients who fail conservative management or those with an added structural component need surgical stabilization, and they may elicit a different picture during rehabilitation. They show poor proprioception and poor dynamic muscle control with a much more softer end-point post stabilization. Hence, delaying their rehab in coordination with the surgeon's input may be beneficial for a good functional outcome.

Surgical procedure

The type of surgical procedure for shoulder instability is determined by the following factors namely, patient's age, recurrence, activity level, ligamentous laxity, percentage of bony defect (glenoid and humeral) [26]. Di Giacomo et al. [27] proposed a concept on bipolar lesion in patients with shoulder instability which focused on the relationship between glenoid bony defect, Hill-Sachs defect and the concept called"glenoid tracking." They measured the Hill-Sachs width, and if it was found to be <83% of the anteroposterior width of the glenoid, it is understood that the Hill-Sachs lesion will be on-track (i.e., it does not engage onto the glenoid neck during ROM). If the Hill-Sachs width was more than 83% of glenoid anteroposterior width, it is considered off-tracking (i.e., Hill-Sachs lesion engaging on to the anterior glenoid). In case of an on-track lesion, a simple arthroscopic Bankart repair is good enough to restore the shoulder joint stability, whereas in case of an off-track lesion, it is vital to prevent the Hill-Sachs lesion from engaging onto the glenoid even during the mid-ROM thereby resulting in failure. Hence, a remplissage procedure is to be added which was proposed by Purchase et al.[28]that is nothing but infraspinatus capsulo-tenodesis on to the Hill-Sachs defect termed in French as "to fill in."Di'Giacomo et al.[27] proposed a treatment paradigm based on which surgical protocol can be designed for treating shoulder instability.

During an arthroscopic Bankart repair, it is important not only to restore the glenoid labrum to its native attachment but also to tighten the lax capsule. Hence, its vital to perform an inferior capsular shift during the labral repair, as a lax capsule may lead to subclinical instability due to poor stabilization and proprioception. If the glenoid bone defect is significant (i.e., more than 25% bone loss) the architecture of the glenoid surface gets deranged, compromising the glenohumeral joint stability. Burkhart and De beer [29] found that an inverted pear-shaped glenoid resulting from loss of anteroinferior glenoid bone led to high failure rate of capsulolabral repair alone. Similarly, Lo et al. [30] realized that ±7.5mm of anterior bone loss (approximately 28.8% of the glenoid) was necessary to convert normal glenoid into an inverted pear. The principle behind an open latarjet has been proposed as the triple effect: (1) The conjoint tendon acting as a sling when the arm is abducted and externally rotated, (2) stability from restoring the glenoid anteroposterior diameter, and (3) the stability provided by repairing the capsule to the stump of the coracoacromial ligament [31]. Recently, it can be performed arthroscopically as well. Patients with >25-30% of anterior glenoid bone deficiency and high-demand patients aged <25 years with glenoid bone loss are candidates for the latarjet procedure. The rehab for a latarjet varies from a standard capsulolabral repair. Usually, the bony healing occurs by 6 weeks [32]. Since, the short head of biceps and coracobrachialis are transferred along with the bone plug, caution is to be exercised while performing elbow curls. The bone healing should be complete by 6weeks beyond which aggressive stretching and strengthening program can be started (Table 2). Ideally, functional return to sports can be achieved as early as 12 weeks, but normally it takes 16-24weeks.

Instability in posterior direction is a special consideration to be noted. Incidence of posterior instability can range from 10% to 100% [33, 34, 35]. Posterior labral lesions include detachment of the posterior labrum, so-called reverse Bankart lesion, flap tear, bucket-handle lesion, chondrolabral erosion, and labral split [33, 34, 35, 36]. Kim et al. [37] identified a superficial tear between the posteroinferior labrum and the glenoid articular cartilage without complete detachment of the labrum, which they termed it as "Kim's lesion." This is an essential lesion to be noted in patients presenting without any true dislocation but vague pain in posterior joint line with or without a palpable clunk that is felt during posterior load and shift on examination. This lesion can be repaired along with a capsular shift and the rehab protocol is more or less similar to that followed for a routine labral repair. Generally speaking, it is advisable not to initiate shoulder motion beyond the safe range until 3 weeks post-surgery as the soft tissue would not have healed strong enough to take on the stress applied during rehabilitation. Usually by 6 weeks, the tissue should be healed enough to begin passive stretching to obtain the necessary ROM for activity. Peak remodeling occurs from 1 to 8 weeks [1]. The repaired tissue should be mature enough at 12-16 weeks to begin most functional activities and return to sport by 24 weeks (Table 3). Initial and periodic consultations with the physician regarding the patient's program and progress are essential.

Dynamic stabilizer facilitation

Dynamic stabilization is provided by the muscles around the shoulder, the coactivation of which provides the necessary stability throughout the ROM [38]. Two force couples are described. Contraction of the subscapularis muscle counteracts contraction of the infraspinatus and teres minor in frontal plane, while the contraction of the deltoid muscle contracts contraction of the lower rotator cuff muscles namely, infraspinatus, teres minor and subscapularis in transverse plane [38]. These force couples are the ones which produce joint compression, which in turn provide maximum joint congruency of the articulating surfaces. The resultant vector force which stabilizes the humeral head is called "balance of forces" [39]. Similarly, a force couple also exits in the scapula-thoracic articulation. Upward movement of the scapula is considered essential in favoring glenohumeral abduction which is provided by co-contraction of the trapezius (upper and lower) and the serratus anterior. Synergistic contraction of the scapular muscles provides a stable base (stable scapula) thereby supporting the glenohumeral movement by drawing the scapula to the thorax (Fig. 1). As the head of the humerus moves in the glenoid fossa, the scapula simultaneously rotates; maintain the gelnohumeral joint alignment and stability. This normal alignment provides an optimal length – tension relationship for the rotator cuff, which is important for glenohumeral dynamic stability. With arm in neutral position, the primary restraint to anterior translation is the superior and middle glenohumeral ligaments [40]. At 45° of abduction, the middle glenohumeral ligament acts to limit anterior translation [40]. Beyond 90° the anterior band of inferior capsule or glenohumeral ligament complex is gradually stressed. When the arm is held posterior to the plane of scapula, stress on the anterior capsule increases further the arm moves into horizontal abduction. If external rotation of the arm is added to this movement, even more stress is placed on the anterior capsule [41]. Generally speaking, exercise should be in the plane of scapula until sufficient healing has occurred, which is close 4-6 weeks (Figs. 2 and 3).

Proprioception

The lack of osseous geometry requires the shoulder to depend on the interaction between the static and dynamic structures to provide joint stability [42]. Functional stability is defined as possessing adequate stability to perform functional activity and results from the interaction between these static and dynamic components [43] and this interaction is mediated by the sensorimotor system. It comprises of the central, sensory and motor integration and processing components of the CNS which is involved in maintaining functional joint stability. Proprioception is defined as the afferent information concerning three submodalities of: Joint position sense, kinesthesia and sensation of resistance [43]. Joint position sense is one ability to consciously recognize where one's joint is oriented in space. Kinesthesia is one's ability to consciously appreciate joint motion. Sensation of resistance is one's ability to appreciate force generated within a joint. All three modalities can be appreciated consciously and unconsciously, mediating neuromuscular control. The mechanoreceptors present in the muscle, tendon, fascia, joint capsule, ligament and skin about the joint [44] contribute to proprioceptive information when maximal deformation occurs at the end ranges of motion [45]. All the afferent proprioceptive information is integrated with messages descending from higher levels of CNS at fusiform neurons within the muscle spindle [46, 47] and is adjusted so that a single composite signal is passed from the muscle spindle to the CNS and directly to alpha motor neurons of the muscle [46, 47]. This resulting proprioceptive input to the CNS results in joint movement and position sense, reflexive muscle contraction, and regulation of muscle tone and stiffness. This proprioceptive input is appreciated at three levels: Spinal level, brain stem, and higher control (cerebral cortex and cerebellum). At spinal level, direct motor responses in the form of reflexes and at the brain stem information from the periphery is integrated with both visual and vestibular input to control automatic and stereotypical movement patterns and modulate balance as well as posture. The cortical level modulates both complex and discrete movements and organizes and prepares motor command. In addition, the cerebellum subconsciously takes information from the periphery and compares outcome movements with expected movements playing a vital role in motor control. The reflexive activity regulates both: extrafusal and intrafusal length, preventing jerky, oscillating type movements. Another mechanism responsible for functional joint stability is the role of preparatory muscle contraction and resulting muscle stiffness which offers quick compensatory responses for external loads, providing joint stability [47, 48]. Smith and Brunolli were the first to demonstrate decreased proprioception after shoulder injury [49] whereas Tibone et al. reported that capsular laxity alone and not mechanoreceptor trauma results in de-afferentation leading to proprioceptive deficits [50]. Muscle fatigue can occur due to accumulation of lactic acid, potassium chloride, bradykinin, arachidonic acid, and serotonin thereby influencing the proprioceptive acuity [46]. Similarly, physiological strain of fatigue can lead to psychological inhibition. Due to decreased kinesthetic sense after fatigue, researchers have concluded that fatigue affects sensation of joint movement, decreases athletic performance and increases fatigue related shoulder dysfunction [51]. The goal of functional rehabilitation is to bring forth awareness of proprioception, dynamic stabilization restoration, preparatory and reactive muscle facilitation and replication of functional activities[52]. Early training of conscious awareness of proprioception is believed to lead eventually to unconscious awareness (Fig.2) (Table 2). Dynamic stabilization restoration is regrouping the rotator cuff and scapulothoracic stabilizers and synchronizing the muscle firing to bring forth an effectively maintained concavity compression in the glenohumeral joint through the ROM (Table 1 and 2) . This can be achieved with weight bearing exercises which will facilitate a level of coactivation of both the glenohumeral and scapulothoracic force couples [39, 53]. Preparatory and reactive muscle facilitation can be achieved by rhythmic stabilization exercises, which prepares the athlete for joint perturbation and unexpected direction of force (Table 3). Other modality for preparatory muscle facilitation can be in the form of plyometrics (Table 3) [54].

Kinetic chain

It refers to the mechanical linkages of body segments that allows for the sequential transfer of forces and motions when performing a task such as throwing [55, 56]. It represents a linked system of interdependent segments, often working in a proximal to distal sequence to impart a desired action at a distal segment [57]. Kibler et al.[55] rightly mentioned what is called as " link fall-out" meaning injury to a distal segment can alter the normal motor programs and impact dynamic stability of the glenohumeral joint. Hence, it is of utmost importance to identify patients with pre-existing problems involving back or lower quadrant before considering for surgery and post-operative rehab. During the initial phase of tissue healing, the core and lower quadrant exercises can be initiated so as to optimize the functional outcome especially in high-demand athletes (Table 1). The scapular evaluation also is considered vital to identify hidden abnormalities which are considered vital for overhead throwing athletes. Evaluation of inflexibilities, including those of the pectoralis minor and glenohumeral internal rotation [58,59] is considered critical. After a thorough evaluation, treatment of throwing injuries should focus on addressing any kinetic chain deficits or altered throwing biomechanics, improving joint stability, and optimizing anatomy [55]. Training the athletes in functional position will help their return to play transition less stressful. Hence, they need to be trained in sports specific positions of function (Table 3) (Fig. 4). This can be achieved through plyometrics, resistance band (theraband) mimicking throwing and serving motion in overhead athletes. Since the joint force exhibited on the shoulder is high, plyometrics should be incorporated only after achieving full, pain free ROM, strength, and dynamic stability.

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Conclusions

Rehabilitation is an inherent component of musculoskeletal system. Its role not only starts postoperatively even before that in the form of prehab. Identifying non-structural causes for instability is essential and primary modality of treatment should be a well-planned rehabilitation program. Understanding the concept of basic tissue healing and providing adequate rest before initiating rehabilitation would further enhance the repaired tissue construct. Focusing on functional rehabilitation (proprioception, kinetic chain, dynamic stabilizer training) is crucial to get high demand athletes back to competitive status

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