FLEX CEUs

Balloon Rotator Cuff Surgery: A Guide for Physical Therapists and Assistants

Introduction

Subacromial balloon arthroplasty is an emerging surgical option for patients with massive or irreparable rotator cuff tears, offering a less invasive alternative to traditional repair. As this procedure becomes more widely used, physical therapists and physical therapist assistants play a critical role in guiding patients through recovery and maximizing functional outcomes.

This course is designed to provide PTs and PTAs with the knowledge, clinical reasoning, and practical tools necessary to support patients following balloon arthroplasty. Participants will gain a clear understanding of the procedure, its impact on shoulder function, and how to tailor rehabilitation to meet each patient's needs. Through a blend of instruction, case-based learning, and real-world strategies, this course empowers clinicians to confidently manage pain, restore mobility, and rebuild strength throughout the recovery process, helping patients return to the activities they love.

Section 1: Rotator Cuff Fundamentals

A comprehensive understanding of rotator cuff anatomy and physiology is critical for physical therapists and physical therapist assistants working with patients experiencing shoulder dysfunction. This foundational knowledge provides the framework for clinical reasoning, accurate assessment, and the development of effective treatment plans, whether for conservative management or post-surgical rehabilitation.

Overview of Rotator Cuff Structure and Function

References: 1, 2

The rotator cuff consists of four muscles: supraspinatus, infraspinatus, teres minor, and subscapularis, often remembered by the acronym SITS. These muscles originate from the scapula and insert on the humerus, forming a musculotendinous cuff around the glenohumeral joint. Together, they provide dynamic stabilization by compressing the humeral head into the glenoid fossa during arm movements and help initiate and control various ranges of shoulder motion.

The supraspinatus originates from the supraspinous fossa of the scapula and passes under the acromion to insert on the superior facet of the greater tubercle of the humerus. It initiates the first 15 degrees of shoulder abduction and contributes to superior stabilization of the joint. The infraspinatus arises from the infraspinous fossa of the scapula and inserts on the middle facet of the greater tubercle. It serves primarily as an external rotator and helps control posterior translation. The teres minor originates from the lateral border of the scapula and inserts on the inferior facet of the greater tubercle, also acting as an external rotator and assisting with joint compression during movement. The subscapularis originates from the subscapular fossa on the anterior surface of the scapula and inserts onto the lesser tubercle of the humerus. As the only rotator cuff muscle on the anterior side of the shoulder, it provides internal rotation and is a key anterior stabilizer.

Each of these muscles converges into a flat tendon that blends with the shoulder joint capsule and inserts into the tubercles of the humerus. These tendons play an essential role in the passive and active stability of the shoulder, helping to maintain humeral head alignment during both static postures and dynamic movement. Degeneration, tears, or inflammation of these tendons, particularly the supraspinatus tendon, which is most susceptible due to its position beneath the acromion, can lead to significant functional impairments, including impingement syndrome, weakness, and instability.

The shoulder's stability relies not only on muscular support but also on a complex network of ligaments and tendons that reinforce the joint and limit excessive motion. The glenohumeral joint capsule is a thin but fibrous structure that encloses the joint and attaches around the glenoid rim and anatomical neck of the humerus. Embedded within this capsule are the glenohumeral ligaments: the superior, middle, and inferior glenohumeral ligaments. These ligaments provide anterior and inferior stabilization, particularly when the shoulder is abducted and externally rotated, positions commonly associated with dislocation risk. The inferior glenohumeral ligament complex, especially its anterior band, is the primary stabilizer during overhead or throwing motions and is frequently involved in shoulder instability cases.

The coracohumeral ligament extends from the lateral aspect of the coracoid process to the greater tubercle of the humerus. It reinforces the upper part of the joint capsule and works with the superior glenohumeral ligament to support the humeral head, especially in the resting position. The transverse humeral ligament, though small, spans the intertubercular groove and helps stabilize the tendon of the long head of the biceps brachii, which passes through the bicipital groove and contributes to anterior shoulder stability.

Superiorly, the coracoacromial ligament runs between the coracoid process and the acromion, forming the coracoacromial arch. This structure serves as a protective roof over the rotator cuff tendons and the subacromial bursa. However, if thickened or positioned abnormally, it can contribute to subacromial impingement syndrome, especially in the presence of rotator cuff weakness or scapular dyskinesis.

The acromioclavicular joint is stabilized by both intrinsic ligaments, called the acromioclavicular ligaments, and extrinsic ligaments, particularly the coracoclavicular ligaments, which include the conoid and trapezoid ligaments. These structures suspend the scapula from the clavicle and resist vertical displacement. The sternoclavicular joint, a saddle-type joint, is supported by the anterior and posterior sternoclavicular ligaments, the interclavicular ligament, and the costoclavicular ligament, which provide firm but flexible stability to the upper extremity's only true bony attachment to the axial skeleton.

Role of Rotator Cuff in Shoulder Stability and Movement

References: 3–5

The rotator cuff plays a central role in both the dynamic stability and functional mobility of the shoulder joint. The rotator cuff serves as the primary stabilizing force that maintains the head of the humerus securely centered in the shallow glenoid fossa during arm movement. This is especially critical given the inherent instability of the glenohumeral joint, which sacrifices bony congruence for maximal range of motion.

During movement, the rotator cuff muscles contract in a coordinated fashion to compress the humeral head into the glenoid, minimizing translation and shear forces. This stabilizing mechanism is particularly important during overhead activities or when the shoulder is subjected to high loads, such as lifting, throwing, or catching. The supraspinatus assists in initiating abduction and helps resist superior migration of the humeral head, particularly in the early phase of elevation. The infraspinatus and teres minor provide external rotation and posterior stability, counteracting anterior glide. The subscapularis contributes to internal rotation and acts as a major anterior stabilizer by resisting excessive posterior translation.

In addition to stability, the rotator cuff muscles allow for precise control of shoulder motion. They fine tune movements initiated by larger muscles such as the deltoid, pectoralis major, and latissimus dorsi, ensuring smooth and coordinated arm elevation, rotation, and positioning. Without adequate rotator cuff function, the larger muscles tend to overpower the joint, leading to dysfunctional mechanics, impingement, or instability.

Impairment or injury to the rotator cuff, whether due to overuse, trauma, or degenerative changes, can disrupt this delicate balance. A weakened or torn rotator cuff often results in altered kinematics, including superior translation of the humeral head, subacromial impingement, or compensatory muscle recruitment. Over time, this can lead to pain, decreased range of motion, reduced strength, and ultimately loss of functional independence.

For physical therapists, understanding the role of the rotator cuff in shoulder mechanics is essential for accurate diagnosis, prevention strategies, and effective rehabilitation planning. Interventions should not only target strengthening the rotator cuff muscles individually but also focus on restoring their coordinated function within the kinetic chain of the shoulder complex.

Partial vs Full Thickness Tears

References: 2, 6

Rotator cuff tears can vary significantly in depth, location, and functional impact. They are generally categorized as either partial thickness or full thickness, depending on the extent of tendon fiber disruption. A partial thickness tear affects only a portion of the tendon, either on the articular side, bursal side, or within the tendon substance itself. In contrast, a full thickness tear extends through the entire thickness of the tendon from the articular to the bursal surface, often creating a complete discontinuity between the tendon and its bony insertion.

Supraspinatus Tears

The supraspinatus is the most frequently torn rotator cuff muscle due to its position beneath the acromion and the mechanical stress it undergoes during arm elevation. Partial thickness tears of the supraspinatus often occur on the articular side and may involve fraying, inflammation, or small fiber disruptions. These tears may still allow for relatively normal function but can cause pain during overhead movements or resisted abduction. A full thickness tear of the supraspinatus results in loss of continuity between the tendon and the greater tubercle of the humerus, leading to weakness in abduction and often a positive drop arm test. In some cases, the tendon retracts medially, complicating surgical repair and rehabilitation outcomes.

Infraspinatus Tears

Tears of the infraspinatus are less common but may occur in conjunction with supraspinatus pathology. A partial thickness tear can present as posterior shoulder pain and weakness with external rotation, especially in athletic populations or those with repetitive overhead activity. Full thickness infraspinatus tears compromise external rotation strength and contribute to joint instability, particularly in the posterior direction. These tears may also alter scapular kinematics as compensation develops over time.

Teres Minor Tears

Tears of the teres minor are rare and typically seen in the context of larger or massive rotator cuff tears involving multiple tendons. Partial tears are uncommon and often go undiagnosed without advanced imaging. Full thickness tears of the teres minor may affect external rotation at 90 degrees of abduction and may be functionally significant in overhead athletes or individuals requiring high levels of shoulder control. Preservation of the teres minor is crucial in massive rotator cuff tear scenarios, especially when other posterior cuff structures are compromised.

Subscapularis Tears

The subscapularis is the largest and strongest rotator cuff muscle, responsible for internal rotation and anterior stabilization of the shoulder. Partial thickness tears often involve the upper portion of the tendon and can cause pain with internal rotation and weakness during belly press or lift-off tests. These tears may be associated with instability of the long head of the biceps tendon, which travels through the bicipital groove adjacent to the subscapularis. Full thickness subscapularis tears significantly impair internal rotation strength and shoulder stability, often presenting with anterior shoulder pain, increased passive external rotation, and functional deficits during tasks like reaching behind the back.

Tear classification directly influences treatment planning and rehabilitation. Partial thickness tears may be managed conservatively with targeted strengthening and scapular stabilization, while full thickness tears, particularly those with retraction or involving multiple tendons, often require surgical repair followed by a structured, progressive rehabilitation protocol. Understanding the tear characteristics for each rotator cuff muscle allows physical therapists to tailor interventions that restore mobility, function, and long-term shoulder health.

Degenerative and Traumatic Causes

References: 1, 6

Rotator cuff tears can arise from both degenerative and traumatic mechanisms, each with distinct pathophysiological features, clinical presentations, and implications for rehabilitation. Understanding these causes is critical for physical therapists and physical therapist assistants to appropriately assess, educate, and guide patients throughout recovery.

Degenerative rotator cuff tears develop gradually over time and are most commonly seen in individuals over the age of 40. These tears are typically the result of chronic wear and tear on the tendon tissue, particularly in the supraspinatus tendon, which endures repetitive stress during overhead and lifting activities. The subacromial space narrows with age due to changes such as acromial spurring, osteophyte formation, and thickening of the coracoacromial ligament. These structural changes can lead to mechanical impingement and reduced vascularity of the tendon, especially on the articular side, contributing to progressive degeneration. Over time, microscopic tendon fiber breakdown, inflammation, and failed healing responses weaken the tendon matrix, making it more susceptible to tearing even with minimal force. Risk factors for degenerative tears include age, smoking, hypercholesterolemia, diabetes, repetitive overhead use, and poor posture. These tears may initially be asymptomatic, but as they progress, patients often report gradual onset of shoulder pain, night pain, weakness, and limited range of motion.

In contrast, traumatic rotator cuff tears occur suddenly as a result of a specific injury or high-force event. These tears are more common in younger or middle-aged individuals and often involve significant external force applied to the shoulder, such as falling on an outstretched hand, a direct blow, or lifting a heavy object with a sudden jerk. Traumatic tears can also occur in conjunction with dislocations, fractures, or labral injuries. In these cases, the rotator cuff tendon may be forcibly detached from its insertion on the humerus, leading to a full thickness tear. Patients with traumatic tears typically present with acute pain, functional loss, and immediate weakness in the affected arm. Early recognition is critical, as surgical intervention may be more successful when performed promptly.

It is also possible for degenerative and traumatic factors to coexist, where a tendon weakened by chronic degeneration is suddenly torn due to an acute event. These "acute-on-chronic" tears are particularly common in older adults who fall or experience sudden trauma. In such cases, the tendon's pre-existing vulnerability complicates both the healing process and functional recovery.

From a rehabilitation standpoint, distinguishing between degenerative and traumatic etiologies is essential for determining prognosis, surgical referral timing, and designing individualized treatment plans. Degenerative tears may respond well to conservative care focusing on strengthening, mobility, and scapular control, while traumatic tears, particularly large or complete disruptions, often require surgical repair followed by phased rehabilitation with early protection and gradual loading strategies.

Functional Limitations Caused by Rotator Cuff Injuries

References: 1, 2, 6

Rotator cuff injuries can significantly impair a patient's ability to perform daily activities, participate in work tasks, and engage in recreational or athletic pursuits. The rotator cuff is essential for both shoulder stability and coordinated movement, and when its structure or function is compromised, whether through tendinopathy, partial tear, or full-thickness tear, these impairments are often reflected in widespread functional limitations.

One of the most commonly reported limitations is difficulty with overhead activities. Patients may struggle with tasks such as reaching into a cabinet, washing their hair, or putting on a shirt. The supraspinatus muscle, responsible for initiating abduction and helping elevate the arm, is often involved in rotator cuff pathology, making these actions particularly painful or weak. Even simple movements like lifting a light object above shoulder height can trigger pain or mechanical dysfunction.

Weakness and fatigue in the shoulder are also hallmark features. The rotator cuff muscles are responsible for stabilizing the humeral head within the glenoid during movement. When these muscles are weakened or torn, dynamic stability is compromised. Patients may report that their arm feels heavy, unstable, or prone to “giving out,” especially during repetitive or resisted tasks. Activities such as carrying groceries, lifting objects from the floor, or using tools at work may become difficult or impossible.

Sleep disturbance is another common functional issue associated with rotator cuff injuries. Many patients experience pain while lying on the affected shoulder or during night-time movements, leading to disrupted sleep and associated fatigue, which can affect healing, mood, and overall well-being.

Functional limitations also extend to reaching behind the back or across the body, activities that require a coordinated combination of glenohumeral rotation and scapulothoracic mobility. Tasks such as fastening a bra, tucking in a shirt, or reaching for a seatbelt may become painful or mechanically restricted. These deficits are especially pronounced with subscapularis or infraspinatus involvement, which control internal and external rotation respectively.

In occupational and athletic settings, rotator cuff injuries can cause reduced work capacity and decreased performance. For manual laborers, limitations in strength and endurance may restrict lifting, pushing, pulling, or tool use. For athletes, particularly those involved in throwing or overhead sports, loss of shoulder control and strength can dramatically impact biomechanics, increasing the risk of compensatory injuries and long-term disability.

Beyond physical limitations, rotator cuff injuries can contribute to psychosocial challenges, including fear of movement, reduced confidence in the arm, and decreased participation in meaningful activities. These factors can prolong recovery and must be addressed through patient education, graded exposure, and functional goal setting.

Physical therapists play a key role in identifying these specific limitations, setting realistic goals, and designing individualized interventions that restore shoulder function, reduce pain, and improve quality of life. Addressing both biomechanical and functional impairments ensures a comprehensive approach that aligns with the patient's personal, occupational, and recreational goals.

Section 1 Key Words

Impingement Syndrome – A condition where the rotator cuff tendons, especially the supraspinatus tendon, and the subacromial bursa are compressed or "impinged" between the head of the humerus and the acromion of the scapula during shoulder movements

Supraspinatus – A rotator cuff muscle originating from the supraspinous fossa of the scapula and inserting on the superior facet of the greater tubercle of the humerus; initiates the first 15 degrees of shoulder abduction and helps stabilize the humeral head by preventing its upward migration during arm elevation

Subscapularis – The largest and strongest rotator cuff muscle, originating from the subscapular fossa on the anterior surface of the scapula and inserting onto the lesser tubercle of the humerus; primarily responsible for internal rotation of the shoulder and provides anterior stabilization to the glenohumeral joint

Coracoclavicular Ligaments – Comprised of the conoid and trapezoid ligaments that connect the coracoid process of the scapula to the clavicle; help to suspend the scapula from the clavicle and provide vertical stability to the acromioclavicular joint, preventing excessive upward displacement of the scapula relative to the clavicle

Section 1 Summary

A thorough understanding of rotator cuff anatomy and physiology is essential for physical therapists and physical therapist assistants caring for patients with shoulder dysfunction. This foundational knowledge supports informed clinical reasoning, precise assessment, and the creation of effective treatment strategies, whether managing patients conservatively or guiding them through post-surgical rehabilitation.

Section 2: Overview of Rotator Cuff Treatment Options

Rotator cuff injuries are among the most common causes of shoulder dysfunction, presenting across a wide range of patient populations. This section provides an overview of the current treatment options, beginning with traditional rotator cuff repair and its surgical principles. It will explore conservative non-surgical approaches, including exercise-based rehabilitation, pharmacologic adjuncts, and activity modification. The course also introduces subacromial balloon arthroplasty, a minimally invasive option for irreparable tears, and explains how it fits into the broader treatment continuum. Finally, we examine emerging evidence and clinical applications that guide appropriate use. By the end of this course, learners will better understand how to match treatment strategies with individual patient needs and goals.

Traditional Rotator Cuff Repair

References: 7, 8

Traditional rotator cuff repair refers to open or mini-open surgical procedures used to reattach torn rotator cuff tendons to their insertion on the greater tuberosity of the humerus. These approaches are typically used for full-thickness tears, large or retracted tears, or in cases where arthroscopic repair is not feasible. The primary goal of the surgery is to restore tendon continuity and shoulder function while minimizing pain and preventing long-term joint degeneration.

In an open rotator cuff repair, the surgeon creates a larger incision over the shoulder to gain direct access to the rotator cuff and surrounding structures. This typically involves a deltoid-splitting approach or detachment of part of the deltoid to expose the subacromial space and rotator cuff tendons. Once the torn tendon is visualized, the surgeon debrides the tendon edges and the footprint on the greater tuberosity to promote a healing environment. The tendon is then reattached to the bone using sutures or suture anchors, which may be metallic or bioabsorbable. This method provides excellent visualization and access, especially for complex or massive tears, but is more invasive and carries a higher risk of soft tissue disruption.

The mini-open repair is a hybrid technique that combines arthroscopic and open methods. The procedure typically begins with an arthroscopic evaluation of the joint and subacromial space, allowing for the assessment of additional pathology such as biceps tendon injury, labral damage, or the need for subacromial decompression. Following arthroscopic preparation, a small incision is made over the lateral shoulder to expose the torn rotator cuff. The tendon is repaired using similar techniques as in the open approach but with reduced deltoid disruption. Mini-open repair offers the advantages of direct tendon access while limiting soft tissue trauma compared to full open repair.

Both techniques may include additional procedures, such as acromioplasty to remove bony impingements or biceps tenodesis or tenotomy if the long head of the biceps tendon is involved. Intraoperatively, attention is given to achieving a tension-free repair with proper tendon-to-bone apposition, as this is critical for optimal healing. The choice between open and mini-open techniques depends on several factors including the size and location of the tear, tissue quality, surgeon experience, and patient-specific considerations.

Overall, traditional rotator cuff repair remains a reliable and effective surgical option for restoring shoulder function in patients with significant rotator cuff pathology. Understanding the surgical procedure, tissue handling, and mechanical fixation involved helps rehabilitation professionals tailor post-operative care and protect the repair during the critical early phases of healing.

Non-Surgical Conservative Management Options

References: 9, 10

Non-surgical management of rotator cuff pathology is a widely accepted and often highly effective approach for addressing shoulder dysfunction and pain, particularly in cases of rotator cuff tendinopathy, partial-thickness tears, degenerative full-thickness tears, subacromial impingement, and other non-acute conditions. This treatment pathway is particularly appropriate for older adults, individuals with lower functional demands, patients with comorbidities that increase surgical risk, or those who express a preference to avoid surgery. The primary goals of conservative care are to reduce pain, improve shoulder function, restore mobility and strength, and enhance overall quality of life. A successful outcome requires a patient-centered, interdisciplinary approach that spans multiple aspects of care.

One of the most important initial components of conservative management is patient education. Patients benefit from a clear explanation of the nature of rotator cuff disease, including the fact that degenerative tendon changes are a common and often age-related finding, not necessarily predictive of poor function. Many individuals with rotator cuff abnormalities remain asymptomatic, and a large proportion of tears can be managed without surgery. Understanding this can help reduce fear and anxiety and empower patients to engage in active rehabilitation. Patients are typically advised to avoid painful overhead activity and repetitive lifting in the early stages, but complete rest is not encouraged. Rather, activity modification strategies are used to reduce mechanical stress on the shoulder while still promoting movement and joint health.

Rehabilitation through exercise is the cornerstone of conservative management and is supported by strong clinical evidence. A physical therapist guides this process, with a focus on restoring pain-free shoulder range of motion, improving scapular mechanics, and building muscular endurance and control. Early-phase interventions may include pendulum exercises, active-assisted movements, isometric activation, and scapular stabilization techniques. As symptoms improve, progressive resistance exercises are introduced to target the rotator cuff—specifically the supraspinatus, infraspinatus, subscapularis, and teres minor—as well as the surrounding scapular stabilizers like the serratus anterior and trapezius. Rehabilitation emphasizes motor control and endurance, using gradual loading and movement integration to reestablish functional use of the upper extremity.

Manual therapy, including joint mobilizations and soft tissue techniques, may be utilized to address capsular stiffness or myofascial restrictions that contribute to altered biomechanics or pain. Techniques such as dry needling, instrument-assisted soft tissue mobilization, or therapeutic taping can be used as adjuncts to support exercise-based progress. Rehabilitation also extends beyond isolated strengthening, incorporating kinetic chain coordination, postural retraining, proprioceptive training, and, eventually, task-specific or occupation-specific movement patterns tailored to the patient's needs.

In many cases, pharmacological treatment is used to manage pain or inflammation alongside physical rehabilitation. Oral non-steroidal anti-inflammatory drugs (NSAIDs) are commonly prescribed in the early phases to reduce discomfort and allow greater participation in movement. Corticosteroid injections into the subacromial space may be used for short-term relief in patients experiencing significant pain, although repeated injections are discouraged due to potential negative effects on tendon tissue. Biologic therapies, such as platelet-rich plasma (PRP) injections, are sometimes pursued, although their efficacy remains controversial and inconsistent in current literature.

Medical imaging, including MRI or diagnostic ultrasound, can assist in the diagnostic process, particularly when symptoms persist or fail to improve. However, it is important to recognize that imaging findings do not always correlate with clinical symptoms, and reliance on imaging should not override functional assessment and clinical reasoning. Imaging may be most appropriate in situations where there is suspicion of a more extensive tear, failure of a comprehensive rehabilitation trial, or a potential need to escalate care to surgical consultation.

A successful conservative care plan is often supported by collaboration among multiple healthcare providers. In addition to physicians and physical therapists, occupational therapists may play a role in helping patients adapt to workplace or daily life demands. Chiropractors, massage therapists, and acupuncturists may provide supportive treatments for symptom management. When chronic pain or psychological factors are involved, behavioral health professionals can contribute to addressing fear-avoidance, pain catastrophizing, or depression that may hinder rehabilitation.

Outcomes for conservative management of rotator cuff pathology are often favorable, particularly for individuals with partial-thickness tears or degenerative tendinopathy. Research shows that a significant proportion of patients can achieve pain reduction and functional improvement without undergoing surgery. Conservative care is especially well-suited for older adults who may not tolerate surgery well, as well as for those with realistic goals and good adherence to rehabilitation. That said, surgery may become necessary if a patient fails to improve after an adequate trial of conservative treatment, typically over the course of three to six months. Indications for surgical referral may include worsening weakness, progressive loss of range of motion, significant disruption of work or daily life activities, or imaging evidence of a large, retracted, or worsening full-thickness tear.

Non-surgical management of rotator cuff pathology represents a comprehensive, evidence-informed, and patient-driven approach to care. It integrates exercise rehabilitation, manual therapy, medication, interdisciplinary collaboration, and education to empower patients and optimize shoulder health. Physical therapists and assistants play a central role in this continuum of care but must remain aware of the broader medical and integrative options available to support recovery and long-term function.

Introduction to Subacromial Balloon Arthroplasty

References: 11–13

Subacromial balloon arthroplasty is an emerging surgical intervention developed to address massive, irreparable rotator cuff tears, particularly in patients who are not ideal candidates for traditional rotator cuff repair or reverse total shoulder arthroplasty. This minimally invasive procedure offers a biomechanical solution to restore shoulder function and reduce pain by supporting the humeral head and improving the natural biomechanics of the glenohumeral joint.

The procedure involves the arthroscopic placement of a biodegradable saline-filled balloon spacer into the subacromial space, between the acromion and the humeral head. This balloon acts as a temporary mechanical buffer that prevents superior migration of the humeral head, a common problem in the absence of a functioning rotator cuff. By restoring a more normal center of rotation and improving deltoid efficiency, the balloon helps maintain shoulder kinematics during active elevation and abduction. The balloon is made of a biocompatible polymer and is gradually resorbed by the body over approximately 12 months.

Subacromial balloon arthroplasty is typically indicated for patients with chronic, irreparable posterosuperior rotator cuff tears, preserved deltoid function, and relatively intact joint surfaces. It is most often considered when patients have failed conservative care and are not optimal candidates for more invasive surgeries. The procedure is performed arthroscopically under general or regional anesthesia, with minimal soft tissue disruption. Once inserted, the balloon is filled with saline to a size that matches the patient's anatomy, then sealed in place to provide immediate support within the subacromial space.

Although the balloon is biodegradable and temporary, studies suggest that its biomechanical effect during the first year of implantation may promote neuromuscular adaptation, reduce pain, and improve shoulder function long-term. The concept is not to permanently replace the rotator cuff but to offer mechanical assistance during a critical period of adaptation. Early clinical evidence shows promising outcomes, particularly in restoring active range of motion and reducing discomfort with fewer complications than more invasive alternatives.

As with any surgical intervention, patient selection and proper diagnosis are critical for success. Subacromial balloon arthroplasty represents a valuable tool in the orthopedic armamentarium for managing complex rotator cuff pathology, especially in patients seeking pain relief and functional gains with lower surgical risk and faster recovery timelines. Rehabilitation professionals working with these patients should be familiar with the procedure's purpose, expected outcomes, and general postoperative guidelines in order to deliver appropriate and safe care.

Balloon Arthroplasty Within the Treatment Continuum

References: 11, 14

Subacromial balloon arthroplasty represents a novel intervention within the broader continuum of care for massive, irreparable rotator cuff tears. Understanding where this procedure fits into the clinical decision-making process is critical for rehabilitation professionals involved in the evaluation, treatment, and post-operative care of patients with chronic shoulder dysfunction.

The treatment of rotator cuff pathology typically begins with conservative management. Most patients presenting with rotator cuff pain, partial-thickness tears, or even some full-thickness tears are initially treated non-surgically through a combination of physical therapy, activity modification, anti-inflammatory medications, and, in select cases, corticosteroid or biologic injections. These approaches often provide meaningful symptom relief and functional improvement without the need for operative intervention.

When non-operative strategies fail to restore function or adequately reduce pain, surgical options are considered based on the tear’s size, chronicity, reparability, and the patient’s overall health and functional goals. In patients with large or massive rotator cuff tears that are determined to be irreparable, due to tendon retraction, poor tissue quality, or fatty infiltration, traditional rotator cuff repair is typically not viable. At this point, the continuum of care shifts toward salvage procedures intended to restore shoulder mechanics and function through alternative means.

This is where subacromial balloon arthroplasty enters the treatment spectrum. It is most appropriately positioned as an intermediate option between non-operative care and more invasive procedures like reverse total shoulder arthroplasty (RTSA), tendon transfers, or superior capsular reconstruction. Balloon arthroplasty offers a less invasive alternative for patients who are not candidates for RTSA due to age, low surgical tolerance, or personal preference, yet continue to experience pain and disability despite conservative management.

The primary goal of the balloon procedure is to restore more normal shoulder biomechanics by reducing superior humeral head migration, thereby improving deltoid efficiency and relieving subacromial compression. While the balloon itself is resorbed over time, its temporary mechanical support can promote improved shoulder mechanics and allow neuromuscular adaptation that may sustain functional gains beyond the life of the implant. In this way, balloon arthroplasty serves both a biomechanical and rehabilitative role, supporting patients as they regain shoulder function, strength, and coordination through focused rehabilitation.

For the PT or PTA, understanding this context is crucial. Patients undergoing subacromial balloon arthroplasty are often managing long-standing dysfunction and may have adapted maladaptive movement patterns over time. Post-operative rehabilitation focuses on restoring pain-free mobility, gradually rebuilding neuromuscular control, and optimizing deltoid function as the primary motor for shoulder elevation. The expectations for functional recovery should be realistic and framed around pain reduction and return to activities of daily living, rather than full strength restoration in overhead or high-demand tasks.

Subacromial balloon arthroplasty fills a unique and important role within the rotator cuff treatment continuum. It serves as a minimally invasive option for individuals with irreparable rotator cuff tears who have exhausted conservative options but are not suited for more extensive surgical procedures. Rehabilitation professionals must be equipped to guide patients through this phase of care, recognizing the goals, limitations, and potential benefits of this innovative intervention.

Emerging Evidence and Clinical Applications

References: 11, 13, 15

Subacromial balloon arthroplasty is a relatively new addition to the surgical management of irreparable rotator cuff tears, and its use continues to evolve as clinical research and outcome data accumulate. Initially developed as a biomechanical solution to restore glenohumeral stability and deltoid function in patients with massive rotator cuff deficiencies, this technique has gained international interest due to its minimally invasive nature and potential to delay or avoid more complex procedures such as reverse total shoulder arthroplasty (RTSA). As the clinical experience with balloon arthroplasty expands, emerging evidence is beginning to clarify its indications, benefits, and limitations.

Recent studies suggest that subacromial balloon implantation may significantly reduce pain and improve shoulder function in appropriately selected patients. Improvements are most consistently seen in forward flexion, pain relief at rest and with activity, and patient-reported outcome measures such as the Constant-Murley Score and American Shoulder and Elbow Surgeons (ASES) score. A growing body of research also highlights the balloon's role in improving deltoid muscle efficiency by restoring the biomechanical fulcrum lost when the rotator cuff is compromised. By creating a temporary spacer in the subacromial space, the balloon helps normalize glenohumeral kinematics and reduces superior humeral migration.

Importantly, these functional improvements often persist beyond the biodegradation of the balloon itself, which typically occurs within 12 months. This suggests that the benefits may not solely depend on the physical presence of the device but may be attributed to neuromuscular retraining, altered movement patterns, or reduced inflammation during the period of mechanical support. In some patient populations, this has resulted in long-term satisfaction and decreased need for further surgical intervention.

However, the evidence is still evolving, and the quality of available studies varies. Early results from European cohorts were promising, but recent randomized controlled trials and systematic reviews have yielded mixed outcomes. Some studies report comparable improvements to reverse shoulder arthroplasty in select patients, while others suggest more modest benefits, particularly in cases with advanced glenohumeral arthropathy or deltoid dysfunction. Consequently, subacromial balloon arthroplasty is not considered a universal solution and is best viewed as one option within a spectrum of care for irreparable cuff pathology.

From a clinical application standpoint, subacromial balloon arthroplasty is particularly well-suited for older adults with massive, irreparable posterosuperior rotator cuff tears who remain symptomatic after conservative care but are not ideal candidates for RTSA due to medical comorbidities or lower functional demands. It may also be considered in active patients seeking to avoid prosthetic joint replacement or who have failed prior cuff repair surgeries. Surgeons may employ the balloon as a standalone procedure or in combination with partial cuff repair or debridement, depending on the integrity of surrounding tissue. The device's temporary nature and low complication rate make it an appealing intermediate step in treatment planning, often providing symptom relief while preserving future surgical options.

From a rehabilitation perspective, understanding the trajectory of these outcomes is essential. Clinicians should be aware that functional improvements may occur gradually and may rely heavily on optimizing deltoid recruitment and scapular mechanics. Since the balloon does not restore contractile tissue, rehabilitation must be carefully progressed, with a focus on retraining motor control and reducing compensatory patterns rather than emphasizing pure strength recovery.

Subacromial balloon arthroplasty holds promise as a minimally invasive alternative in the management of massive, irreparable rotator cuff tears. While early evidence supports its efficacy in reducing pain and restoring function in specific patient populations, ongoing research is needed to refine selection criteria, compare outcomes to other surgical options, and define long-term durability. Rehabilitation professionals play a critical role in maximizing outcomes by applying informed, individualized care that aligns with both the mechanical effects of the implant and the evolving evidence base.

Section 2 Summary

Managing rotator cuff pathology requires thoughtful consideration of injury severity, tissue quality, patient goals, and available interventions. While surgical repair remains standard for reparable tears, many patients benefit from structured conservative management. For those with irreparable tears, subacromial balloon arthroplasty offers a promising middle ground, less invasive than joint replacement, but biomechanically supportive. Current evidence supports its use in select populations, with ongoing research refining its role. As treatment options expand, clinicians must integrate evidence, patient values, and rehabilitation principles to guide care across the continuum. This section equips providers with the knowledge to support informed, effective treatment planning at every stage.

Section 2 Key Words

Open Rotator Cuff Repair – A traditional surgical technique where a large incision is made over the shoulder to allow direct visualization of the rotator cuff

Mini-Open Rotator Cuff Repair – Combines arthroscopic and open surgical techniques where arthroscopy is first used to assess the joint, remove damaged tissue, and perform subacromial decompression

Subacromial Balloon Arthroplasty – A minimally invasive surgical procedure used to treat massive, irreparable rotator cuff tears where a biodegradable balloon is inserted arthroscopically into the subacromial space and filled with saline

Section 3: Understanding Subacromial Balloon Arthroplasty

Subacromial balloon arthroplasty is a relatively new surgical intervention designed for the treatment of massive, irreparable rotator cuff tears. As a minimally invasive procedure, it offers an alternative to more extensive surgeries like reverse total shoulder arthroplasty (RTSA), particularly in patients who are not ideal candidates for joint replacement due to age, comorbidities, or functional goals. This technique involves the implantation of a biodegradable saline-filled balloon into the subacromial space to restore shoulder biomechanics, reduce pain, and improve function. Understanding the surgical principles, biomechanical mechanisms, clinical indications, and regulatory background of this procedure is essential for rehabilitation professionals involved in post-operative care and interdisciplinary management.

Surgical Principles and Biomechanics

References: 16, 17

Subacromial balloon arthroplasty is performed arthroscopically, meaning it is done through small incisions using a camera and specialized instruments. The patient is typically positioned either sitting up (beach-chair position) or lying on their side (lateral decubitus), depending on surgeon preference and anatomy. The procedure begins with establishing portals, small entry points for the arthroscope and tools. The surgeon first inspects the joint and then clears the subacromial space by removing inflamed bursal tissue and debris. This preparation is important for creating room for the balloon and allowing clear visualization. Some soft tissue structures, like the coracoacromial ligament and medial bursa, are intentionally preserved to help hold the balloon in place after implantation.

Once the area is prepared, the surgeon measures the space under the acromion (the bony top of the shoulder) in two directions: front-to-back and side-to-side. These measurements determine the correct balloon size of small, medium, or large. If the measurement is borderline between two sizes, the larger one is chosen to ensure better fit and coverage. The balloon implant is made from a biodegradable material and comes folded inside a delivery sheath. It is carefully inserted into the subacromial space and positioned just medially (toward the center) of the shoulder socket. Once in position, the balloon is inflated with sterile saline until it expands to fill the space and gently pushes the humeral head downward to restore a more normal position in the joint.

Importantly, the balloon is not stitched or anchored in place. Instead, it stays secure by friction, soft tissue tension, and the "pocket" of space created during the cleanup phase. The balloon maintains its structure for several months before gradually dissolving over about a year. Because it is made from a resorbable material, there is no need for a second procedure to remove it.

From a biomechanical perspective, the balloon plays a key role in restoring shoulder function after a massive rotator cuff tear. When the rotator cuff is irreparably damaged, the humeral head tends to migrate upward due to the unopposed pull of the deltoid muscle. This disrupts normal shoulder motion and causes pain. The inflated balloon acts like a cushion or spacer, physically lowering the humeral head and helping it stay centered in the joint during movement. This improves the mechanics of the shoulder, making it easier for the deltoid to lift the arm without causing impingement or discomfort.

Studies in both cadavers and patients have shown that the balloon increases the subacromial space by 5 to 8 millimeters and helps restore the joint's center of rotation. This change reduces the load on the deltoid, improves its ability to generate force, and decreases pressure between the bones during motion. These improvements can allow patients to regain functional range of motion, particularly forward elevation and abduction, even without restoring the torn rotator cuff tendons.

Although the balloon itself is temporary, its biomechanical benefits during the first 6 to 12 months may provide a window for the body to adapt. Patients often experience improved movement patterns, muscle recruitment, and pain relief during this time, and many retain these gains even after the balloon has dissolved. For the right patients, the spacer doesn't "fix" the rotator cuff but helps restore enough shoulder mechanics to support meaningful function and quality of life.

How the Balloon Supports the Shoulder

References: 17,18

In cases of massive rotator cuff tears, especially those involving the supraspinatus and infraspinatus, the shoulder loses its primary stabilizers during elevation. The deltoid muscle becomes the dominant elevator, but without the downward counterforce of a functioning rotator cuff, its pull causes the humeral head to migrate upward into the acromion. This results in impingement, loss of joint congruency, pain, and a limited active range of motion. The subacromial balloon functions as a dynamic spacer, restoring 5 to 8 millimeters of vertical clearance between the humeral head and the acromion. This mechanical support re-centers the humeral head, recreating a more normal pivot point that allows the deltoid to function more efficiently. By improving the deltoid's moment arm, the balloon reduces the amount of effort needed to lift the arm and lowers compressive forces that otherwise provoke discomfort.

Although the balloon does not replace or repair tendon tissue, it alters the biomechanics of the joint in a way that allows remaining muscles, including the long head of the biceps and scapular stabilizers, to function more effectively. This improved mechanical environment not only reduces pain but also creates an opportunity for neuromuscular re-education. Postoperative imaging often shows reduced bursal fluid and decreased signs of inflammation within weeks, supporting the idea that the balloon provides both mechanical and secondary anti-inflammatory benefits. Overall, it gives the shoulder a more functional platform, enabling the patient to recover meaningful motion even in the absence of a viable rotator cuff.

Biomechanical Impact of the Implants

References: 15, 18

The biomechanical effects of subacromial balloon arthroplasty have been demonstrated through cadaver studies, fluoroscopy, and in vivo clinical data. One of the primary benefits is restoration of the humeral head position. In shoulders with irreparable cuff tears, the humeral head tends to shift upward during elevation, disrupting normal glenohumeral movement. Once the balloon is inflated, it re-centers the head in the glenoid socket, increasing the subacromial space and restoring a more anatomic acromiohumeral interval, typically to 10 to 12 millimeters. This helps relieve compression on inflamed bursal tissue and reduces contact between bone and soft tissue.

Another important biomechanical change is the reduction of subacromial pressure. Studies have shown that the balloon reduces peak compressive forces between the humeral head and acromion by more than 50 percent during arm elevation. This mechanical unloading allows for more comfortable movement and protects surrounding structures from further degeneration. In addition, the balloon enhances deltoid efficiency. With the humeral head re-centered, the deltoid can produce the same amount of motion with less force, improving functional performance and reducing compensatory movements such as trunk lean.

The balloon maintains its structural support for approximately three months before gradually degrading over the course of a year to a year and a half. During this time, patients adapt to new movement patterns and regain control of the shoulder with less pain and better function. Even after the implant is fully resorbed, many patients continue to experience long-term gains, suggesting that the balloon acts as a biomechanical "reset," creating a window for motor learning and soft tissue adaptation that outlasts the physical presence of the device.

Indications and Contraindications

References: 17–21

Subacromial balloon arthroplasty is specifically intended for patients with massive, irreparable posterosuperior rotator cuff tears, typically involving the supraspinatus and infraspinatus tendons, where surgical repair is not possible due to tendon retraction and poor tissue quality. These patients often have imaging findings showing tendon retraction medial to the glenoid rim and substantial fatty infiltration of the rotator cuff muscles, classified as Goutallier grade 3 or 4. This grading system assesses fatty degeneration on MRI, with grade 3 indicating equal parts muscle and fat, and grade 4 indicating more fat than muscle, which significantly reduces the likelihood of successful tendon healing after repair. Despite this, the glenohumeral joint cartilage remains relatively preserved, making patients candidates for less invasive procedures. Appropriate patients typically fall within Hamada stage 1 or 2, which are part of a staging system that assesses the extent of rotator cuff tear arthropathy. Stage 1 indicates no acromiohumeral narrowing, and stage 2 indicates early narrowing without acetabularization or significant joint degeneration, meaning the joint structure is still favorable for non-arthroplasty interventions.

The ideal candidate is someone who continues to have pain and functional limitations despite conservative measures, such as at least three to six months of physical therapy, corticosteroid injections, nonsteroidal anti-inflammatory medications, and activity modification. Most commonly, these are older adults aged 65 and above who are either medically unfit for reverse total shoulder arthroplasty (RTSA) due to comorbidities or who wish to avoid joint replacement altogether. However, younger or middle-aged patients (in their 50s to early 60s) may also consider balloon arthroplasty to delay more invasive surgery, particularly if they are not involved in high-demand overhead work or athletics. What is most important for all candidates is that they retain active forward elevation of at least 70 to 90 degrees, which indicates that the deltoid muscle is functional and the axillary nerve is intact, both of which are essential for successful use of the balloon implant.

In addition to preserved deltoid function, a functional or repairable subscapularis tendon is required. The subscapularis plays a vital role in stabilizing the humeral head from the front of the joint. Its function creates a critical force couple with the posterior rotator cuff or, in the absence of a repairable cuff, with the mechanical support provided by the balloon. Without this balance, the humeral head remains unstable, and the spacer cannot restore functional joint kinematics.

Equally essential is the patient's ability to participate in post-operative rehabilitation. This includes guided exercises focused on deltoid strengthening, scapular control, and retraining coordinated shoulder movement. Patients must also have realistic expectations, as the balloon is not intended to restore full strength or allow a return to high-performance overhead activities. Instead, the goal is to reduce pain and improve the ability to perform basic functional tasks such as reaching overhead, grooming, dressing, and other daily living activities.

There are several key contraindications where this procedure is not appropriate. Patients with active infection, whether local (in the subacromial space or skin) or systemic, are not candidates for balloon implantation. Likewise, those with advanced glenohumeral arthritis, defined by Hamada stages 3 or higher, should not undergo the procedure. Stage 3 or above is characterized by acetabularization of the acromion (a concave remodeling of the bone due to chronic contact with the humeral head) and cartilage wear that shifts the primary pain source from mechanical impingement to joint degeneration. In such cases, reverse shoulder arthroplasty is typically more appropriate. Patients with pseudoparalysis, a condition where the patient cannot lift the arm despite having no neurological deficit, are generally not good candidates, particularly when caused by deltoid dysfunction or axillary nerve injury, as the balloon relies on preserved deltoid action to create motion.

Patients with irreparable subscapularis tears, which disrupt the anterior stabilizing force, or those with combined anterior and posterior cuff failure, also fall outside the recommended criteria. In these shoulders, the humeral head cannot be adequately centered or stabilized, reducing the effectiveness of the balloon.

Additional contraindications include severe osteoporosis, which can impair subacromial support and balloon retention; poor general health or systemic conditions like uncontrolled diabetes; and inability to comply with post-operative care due to cognitive, psychiatric, or physical limitations.

Lastly, individuals who require high-demand shoulder function, such as athletes, heavy laborers, or those expecting to return to overhead sports or lifting, should not be considered for this procedure, as it does not restore rotator cuff power or joint stability to the level needed for such activity. Instead, it is best reserved for patients seeking meaningful pain relief and functional improvements in daily life, with the understanding that it is a joint-preserving, symptom-modifying intervention, not a curative one.

Subacromial balloon arthroplasty is a viable option for a very specific group of patients with irreparable rotator cuff pathology, minimal joint degeneration, and preserved muscle function, who are looking for an alternative to arthroplasty or tendon transfer. Understanding and applying appropriate selection criteria, including structural imaging findings like Goutallier and Hamada grading, physical examination, and patient goals, is essential for achieving successful outcomes with this innovative but selective surgical approach.

Clinical Background and FDA Approval

References: 15, 22

Subacromial balloon arthroplasty was developed in Israel in the late 2000s as an innovative solution for patients with massive, irreparable rotator cuff tears. Engineers at OrthoSpace Ltd. designed a biodegradable saline-filled spacer, later known as the InSpace™ implant, to be inserted into the subacromial space and restore shoulder function by creating separation between the humeral head and acromion. The goal was to provide pain relief and improve biomechanics in patients for whom rotator cuff repair was not an option. Following successful early laboratory testing, the device received a CE mark in Europe in 2010, allowing for its clinical use.

Initial procedures took place in Israel, France, and Italy, where orthopedic surgeons began reporting promising outcomes. Early clinical series between 2013 and 2016 documented rapid reductions in pain, improved shoulder function, and increased active forward elevation, often by 30 to 40 degrees. The low complication rate, combined with the device's minimally invasive nature and quick recovery profile, led to its widespread adoption across Europe, the Middle East, and parts of South America. The procedure was particularly attractive in regions where access to more complex interventions such as reverse total shoulder arthroplasty (RTSA) was limited.

To support approval in the United States, OrthoSpace conducted a prospective, multicenter clinical trial involving 184 patients across 20 U.S. orthopedic centers. Participants were randomized to receive either balloon arthroplasty or arthroscopic partial rotator cuff repair. After two years of follow-up, the balloon group demonstrated comparable, and in some outcomes, superior improvements in pain relief, ASES (American Shoulder and Elbow Surgeons) scores, and Constant-Murley scores. Additionally, patients in the balloon group had a significantly shorter operative time compared to those receiving partial repair. These findings led to a successful De Novo request, and in August 2021, the FDA granted market authorization for the InSpace™ system for the treatment of massive, irreparable posterosuperior rotator cuff tears.

Following approval, Stryker, which had acquired OrthoSpace in 2019, expanded the product's reach throughout the United States. In 2022, the Centers for Medicare and Medicaid Services established a dedicated outpatient billing code (C9781), enabling broader access through ambulatory surgery centers and hospital outpatient departments. According to Stryker, over 41,000 balloons have been implanted globally, with thousands of procedures now performed in the U.S. Clinical follow-up data continues to support the device's safety and efficacy. Studies have shown that approximately 75 percent of patients maintain functional improvements for at least five years after surgery, and only 15 percent eventually require conversion to RTSA. Device-specific complications such as balloon migration, early deflation, or synovitis have remained uncommon, occurring in fewer than 5 percent of cases.

Today, subacromial balloon arthroplasty is viewed as a bridge between conservative treatment and more invasive surgical interventions like tendon transfer or shoulder arthroplasty. The procedure is most commonly performed in outpatient settings due to its short surgical duration, often less than 30 minutes, and the absence of permanent implants or hardware. Surgeons increasingly utilize the balloon in combination with partial rotator cuff repair or biologic augmentation, especially in younger patients aiming to preserve future surgical options and avoid joint replacement.

Current clinical guidelines emphasize that careful patient selection is essential. Ideal candidates are those with massive, irreparable posterosuperior cuff tears, minimal glenohumeral arthritis, retained active forward elevation, and preserved deltoid and subscapularis function. Postoperative success also depends on structured rehabilitation and realistic patient expectations regarding functional goals.

As additional clinical data emerge, research is expanding into new applications, including comparative cost-effectiveness studies versus RTSA, outcomes in younger or high-demand patients, and long-term durability across different populations. While subacromial balloon arthroplasty remains a selective intervention, it is increasingly recognized as a valuable option within the broader continuum of rotator cuff treatment, offering a balance between function, recovery, and future flexibility in appropriate candidates.

Section 3 Key Words

Acromiohumeral Interval - The vertical space between the underside of the acromion and the top of the humeral head

Goutallier Grade - A radiologic grading system used to evaluate fatty degeneration of the rotator cuff muscles, most commonly seen on MRI or CT scans; ranges from Grade 0 (normal muscle) to Grade 4 (severe fatty infiltration)

Hamada Stage – A radiographic system used to assess the severity of rotator cuff tear arthropathy, based on changes seen in the acromiohumeral interval and joint degeneration

Section 3 Summary

Subacromial balloon arthroplasty represents a valuable addition to the surgical treatment options for patients with massive, irreparable rotator cuff tears. Its minimally invasive nature and ability to preserve future surgical pathways make it especially useful for individuals who may not be ideal candidates for more extensive procedures like reverse total shoulder arthroplasty. By restoring joint mechanics through a biodegradable saline-filled implant, this procedure offers meaningful improvements in pain and function for appropriately selected patients. For rehabilitation professionals, a clear understanding of the surgical technique, biomechanical principles, patient selection criteria, and clinical context is essential to support optimal outcomes and guide effective post-operative care.

Section 4: Post-Operative Rehabilitation Framework

Subacromial balloon arthroplasty is an emerging surgical intervention used to manage massive, irreparable rotator cuff tears in select patient populations, particularly those with chronic pain, functional limitations, and minimal osteoarthritis. Unlike traditional tendon repair, SBA does not involve tissue reattachment or biological healing of the rotator cuff. Therefore, post-operative rehabilitation must be uniquely tailored to respect the implant's mechanical role, support neuromuscular adaptation, and gradually restore functional mobility and strength. A successful rehabilitation framework for SBA should be phase-based, symptom-guided, and individualized. It emphasizes early pain control and passive mobility, followed by progressive motor retraining and functional strengthening as the balloon gradually biodegrades. The clinical goals shift from protection and motion preservation in the early stages to reconditioning and reintegration into meaningful activities in the later phases. Understanding the mechanical behavior of the implant, the absence of biological repair, and the timeline of tissue response is essential for guiding safe and effective rehabilitation progression.

Phased Recovery Approach

References: 19, 23

Rehabilitation following subacromial balloon arthroplasty is structured to protect the implant during its early integration, promote neuromuscular adaptation, and restore functional shoulder mechanics. Because the balloon serves as a temporary spacer rather than a tissue repair, the goal of rehabilitation is not tendon healing but rather motor retraining, pain reduction, and restoring a practical range of motion. A phased approach, divided into early, middle, and late stages, allows for progressive loading and gradual return to daily activities while respecting the implant's function and natural degradation timeline.

In the early phase (weeks 0 to 4), the primary focus is on protecting the surgical site, controlling pain and inflammation, and maintaining passive range of motion without placing undue stress on the subacromial space. The patient typically wears a sling for comfort, especially during the first two weeks, though it may be used longer depending on the surgeon's preference. Rehabilitation during this phase is limited to passive shoulder movements within pain-free limits, especially forward elevation and external rotation, with care to avoid extension, internal rotation behind the back, or combined movements that could disrupt the balloon. Scapular mobility exercises should begin early to maintain thoracoscapular rhythm, along with gentle isometric deltoid and rotator cuff activation in gravity-minimized positions. Patient education is critical, including clear guidelines to avoid lifting, pushing, pulling, or any overhead use of the arm during this time.

The middle phase (weeks 4 to 10) introduces more active participation from the patient. As pain and inflammation subside, the focus shifts to restoring active range of motion (AROM) and initiating light strengthening. Patients can begin with active-assisted exercises and transition gradually to full AROM. Scapular stabilization becomes a central component, using closed-chain exercises such as wall slides and quadruped rocking to build control without overloading the shoulder. Light resistance exercises targeting the deltoid and rotator cuff can begin using resistance bands or small handheld weights (2–3 pounds or less), keeping movements slow, controlled, and within a pain-free range. Emphasis should be placed on postural correction and neuromuscular coordination, particularly re-educating the deltoid to work efficiently with the stabilized humeral head. Overhead loading and aggressive compound movements remain restricted, as the balloon implant is still providing biomechanical support during this window.

In the late phase (weeks 10 to 16 and beyond), rehabilitation goals include improving muscular endurance, restoring functional strength, and facilitating a safe return to activities of daily living. As the balloon begins to degrade naturally around the 3- to 6-month mark, the shoulder must have already adapted to functioning with better alignment and movement patterns. Strengthening exercises can progress to include multi-planar motion such as scaption, resisted flexion, and prone horizontal abduction. Proprioceptive drills, rhythmic stabilization, and controlled dynamic movement should be added to enhance shoulder control under load. Patients may also begin light functional training, including reaching tasks, lifting at shoulder height, and transitional movements like grooming or dressing. Discharge goals typically include pain-free AROM to at least 130 degrees, restored confidence in shoulder use, and an independent home program for long-term maintenance.

Throughout all phases, it is essential to emphasize that the balloon implant does not restore rotator cuff tissue but creates a temporary biomechanical advantage that allows the patient to regain functional use of the arm. The quality of movement is prioritized over strength or speed, and realistic expectations must be reinforced. The success of rehabilitation relies on coordinated care, patient adherence, and appropriately paced progression based on symptoms and functional milestones. With this approach, subacromial balloon arthroplasty can offer significant improvements in pain, mobility, and quality of life for appropriately selected patients.

Evidence-Informed Rehab Strategies

References: 17, 23, 24

Rehabilitation after subacromial balloon arthroplasty requires a specialized, evidence-informed approach that reflects the unique biomechanical function of the implant and the absence of traditional rotator cuff repair. Unlike procedures that rely on tendon healing, the success of balloon arthroplasty hinges on optimizing neuromuscular control, restoring efficient joint mechanics, and safely progressing functional capacity while the biodegradable spacer remains in place. As the implant temporarily improves deltoid leverage and reduces superior humeral head migration, rehabilitation strategies must align with the body's natural tissue response phases, including inflammation, proliferation, and remodeling, and account for the implant's gradual degradation over time.

Progression Based on Tissue Healing Timelines

Rehabilitation after subacromial balloon arthroplasty must align with the expected soft tissue healing response and the mechanical behavior of the balloon spacer over time. Although there is no tendon-to-bone healing, the joint still undergoes inflammatory, proliferative, and remodeling phases, and the implant itself serves a temporary function. The timing of exercise progression must reflect these physiological changes to ensure that movement and loading demands are matched to the shoulder's capacity to respond and adapt.

During the inflammatory phase (0–2 weeks), the focus is on protection and reducing irritation to surrounding tissues. Surgical trauma results in local inflammation, and early overuse may increase subacromial pressure and disrupt postural support. Exercises during this window should be gentle and passive, aimed at preventing stiffness without introducing shear or load. The sling aids in minimizing motion and helps the patient establish a safe baseline for healing.

As the proliferative phase begins (2–6 weeks), pain typically decreases, and tissue pliability improves. This is the appropriate time to begin guided active-assisted and active movements, focusing on restoring smooth, controlled motion within a functional range. The balloon is still intact and maintaining subacromial space, so the deltoid can start being retrained for shoulder elevation without the typical compensation required in cuff-deficient shoulders. Isometric strengthening and neuromuscular reeducation can begin at low intensities, especially for the scapular stabilizers and the deltoid.

In the remodeling and adaptive phase (6–16+ weeks), the joint environment stabilizes, and the spacer begins to gradually biodegrade. By this stage, the shoulder must function increasingly without the biomechanical assistance of the balloon, relying on motor control, coordination, and strength gains made in earlier phases. Resistance can be progressively increased, and exercises become more dynamic, incorporating eccentric control, functional reach, and load-bearing activities. Importantly, the shoulder must be prepared to manage daily demands without relying on the spacer, making this phase critical for functional integration and patient confidence.

Across all phases, clinicians must use both time-based milestones and symptom-guided criteria to determine readiness for progression. Pain levels, movement quality, strength symmetry, and motor control are all essential benchmarks. Additionally, the degradation timeline of the balloon (typically around 3–6 months) should inform when to wean off compensatory strategies and challenge the shoulder more dynamically. By basing rehabilitation on these physiological principles and healing timelines, clinicians can safely guide patients through recovery while maximizing function and reducing the risk of reinjury or mechanical overload.

Guidelines for Appropriate Exercise Selection

Exercise selection following subacromial balloon arthroplasty must be guided by a clear understanding of the procedure's biomechanical goals, the absence of rotator cuff repair, and the patient's healing stage and functional tolerance. Unlike traditional rotator cuff repair, where exercise is limited primarily to protect tendon healing, this procedure relies on restoring coordinated muscle activation and controlled joint mechanics. The balloon implant serves as a temporary spacer, reducing superior migration of the humeral head and improving deltoid leverage.

Therefore, exercises must prioritize motor retraining, scapular stability, and functional movement integration rather than isolated strength gains.

In the early postoperative phase, exercises should be passive or very low load, selected to maintain joint mobility without activating the shoulder musculature. Movements must remain within pain-free ranges and should be designed to avoid compression of the subacromial space. Passive forward elevation and external rotation, pendulums, scapular clocks, and manual mobilizations are appropriate. Any active movement or resisted motion during this stage risks disrupting the mechanical role of the balloon and irritating sensitive periarticular tissues. Clinicians should also avoid exercises that involve internal rotation behind the back or combined motions that increase strain across the superior shoulder.

As patients enter the middle phase of recovery, the criteria for exercise selection shift to emphasize smooth active motion, scapular coordination, and low-level resistance in supported positions. Exercises should aim to reintroduce muscle activation without provoking pain or compensatory patterns. Active-assisted range of motion (AAROM) transitions to active range of motion (AROM), and isometric exercises can begin for the deltoid and scapular stabilizers. Closed-chain positions, such as wall slides, quadruped weight shifts, or ball-on-wall drills, are especially beneficial in this phase, offering proprioceptive input and joint compression without excessive shear forces. Light resistance using tubing or handheld weights (≤3 lbs) may be added gradually, with a focus on endurance and control rather than maximal output.

Later in rehabilitation, as patients regain functional mobility and the balloon begins to degrade, exercise selection should support full return to daily and recreational activities. At this point, more dynamic and load-bearing tasks can be introduced, provided the patient demonstrates good movement quality and no signs of instability or pain provocation. Exercise choices should reflect real-world functional patterns: resisted scaption, horizontal abduction, and shoulder flexion with progressive resistance are common additions. Incorporating multi-planar movement, eccentric control drills, rhythmic stabilization, and trunk integration (lunge with reach or diagonal lift patterns) prepares the shoulder for full-body demands. Functional exercises, such as reaching, lifting at shoulder height, and light overhead tasks, can be introduced with a focus on smooth transitions and symmetrical movement strategies.

Throughout the entire rehabilitation process, exercise selection must remain symptom-guided. Clinicians should use the patient's response, especially pain (both during and 24 hours after activity), movement compensation, and perceived effort, as criteria for progression or regression. Quality of movement should always precede quantity or intensity. Exercises that reinforce proper scapulohumeral rhythm, deltoid efficiency, and global postural alignment are preferable to those that isolate muscle groups in non-functional patterns. In patients with high irritability or comorbidities, simpler, lower-load options may be maintained longer. For more active or athletic patients, progression to higher-level drills, such as plyometrics, reactive stability, or sport-specific loading, can occur with close supervision and appropriate readiness testing.

Effective exercise selection after subacromial balloon arthroplasty requires thoughtful progression based on tissue healing, motor control, and patient-specific goals. Early on, the focus is on mobility and protection; in the middle phase, activation and control; and later, strength and reintegration into meaningful activities. Clinicians should consistently prioritize exercises that enhance coordination, stability, and functional capacity without compromising the mechanical role of the implant or introducing undue stress on an already compromised rotator cuff complex. This individualized, phase-appropriate approach supports optimal outcomes and a safe return to activity.

Pain and Mobility Management

References: 25, 26

Pain and mobility management are essential elements of rehabilitation following subacromial balloon arthroplasty. This procedure is typically performed in patients with chronic, irreparable rotator cuff tears and is designed to reduce pain and improve shoulder mechanics by restoring subacromial space using a biodegradable balloon spacer. Unlike traditional tendon repair, SBA does not rely on tissue healing at the repair site but instead facilitates mechanical support while the shoulder adapts to improved joint positioning. As such, rehabilitation must emphasize symptom control, gentle mobility, and neuromuscular retraining rather than protection of biological repair. A strategic, phase-based approach to pain and mobility is required to maximize comfort, maintain joint health, and promote functional recovery.

In the acute postoperative phase (typically weeks 0 to 2), the primary goals are to reduce inflammation, manage discomfort, and prevent stiffness. Pain management begins with a combination of pharmacologic and physical interventions. Patients are often prescribed NSAIDs or acetaminophen to address baseline pain and inflammation and may also be given a short course of opioids for breakthrough pain, especially in the first few days post-surgery. In many cases, an interscalene nerve block administered at the time of surgery provides effective pain relief for the first 24–48 hours, reducing early muscle guarding and improving tolerance to passive movement. Cryotherapy is a key non-pharmacologic strategy during this stage. Regular application of cold packs or a continuous flow cold therapy device for 15–20 minutes multiple times per day can significantly reduce pain, swelling, and muscle spasm. Therapists should instruct patients to use cold therapy especially after exercise sessions and before sleep to support recovery.

Proper positioning and patient education also play important roles in comfort management. Patients should be instructed to sleep or rest in a semi-reclined position using pillows or a wedge under the upper body and arm to prevent dependent positioning or strain on healing tissues. The surgical arm may be supported with a rolled towel or small pillow under the elbow to maintain neutral alignment. A sling is typically worn full-time during the first one to two weeks, primarily for protection and comfort. However, prolonged immobilization should be avoided, and patients should be encouraged to gently move their arm within the surgical protocol to avoid stiffness and disuse.

Manual therapy techniques can also support early pain relief. Gentle soft tissue mobilization targeting common areas of postural compensation, such as the upper trapezius, pectorals, and posterior deltoid, may help reduce muscle tension and alleviate guarding. Light joint oscillations and scapular mobilization techniques can be applied within a pain-free range to desensitize local structures and maintain early mobility. Some clinicians may also use kinesiology taping to provide proprioceptive support and reduce postural strain, especially in patients who present with guarding or compensatory neck and shoulder elevation. For patients with persistent or chronic pain, transcutaneous electrical nerve stimulation (TENS) can be introduced during subacute phases to help manage discomfort during rest or mobility exercises.

Restoring range of motion after SBA must be approached gradually and with care to avoid irritating the healing joint. During the early recovery phase (weeks 0 to 4), mobility work should focus exclusively on passive or active-assisted movement within pain-free limits. Passive shoulder flexion and external rotation can be performed using a wand or cane, with the non-involved arm assisting the movement. Table slides are particularly useful for promoting low-load flexion and abduction, allowing the patient to move the arm on a smooth surface with minimal effort. Pulley systems are another safe and effective way to facilitate gentle forward elevation and can be used in seated or standing positions depending on the patient's balance and comfort. Pendulum exercises, although basic, are an important early tool for promoting joint fluid exchange and reducing stiffness without active muscle recruitment. These exercises should be done with a relaxed arm and minimal movement.

Scapular mobility should be addressed early and consistently throughout all phases of recovery. Exercises such as scapular clocks, scapular retraction, and manual scapular glides help preserve thoracoscapular rhythm and prevent compensatory shoulder hiking. These movements support the eventual restoration of overhead mobility by maintaining the scapula's ability to upwardly rotate, tilt, and glide appropriately. Foam rollers and thoracic mobilization drills can be added cautiously in patients with poor postural alignment or thoracic stiffness. For example, lying supine over a foam roller with gentle thoracic extension helps improve spinal mobility and indirectly supports shoulder range without stressing the glenohumeral joint.

As patients enter the middle phase of rehabilitation (typically weeks 4 to 10), mobility techniques can be progressed to include active-assisted and active range of motion in gravity-minimized positions. Supine or sidelying shoulder flexion, external rotation with a dowel, and wall walks are appropriate during this stage. As motion improves and pain decreases, light dynamic stretches such as wand-assisted elevation or gentle doorway stretches for pectoral lengthening may be added. It is critical to avoid aggressive stretching or end-range loading, as this can lead to increased inflammation or compromise the biomechanical support the balloon provides. Movement should remain slow, controlled, and within a 0–3/10 pain range. Overstretching or pushing past end range often leads to post-exercise soreness, which should resolve within 24 hours; if not, the session may have exceeded the tissue's current tolerance.

In the later phase of rehabilitation (typically weeks 10 to 16 and beyond), mobility work becomes more functionally oriented. The biodegradable balloon begins to gradually degrade around this time, and the shoulder must rely increasingly on neuromuscular control and muscular endurance to maintain joint alignment. At this point, more complex stretches and mobility tools can be introduced, including TRX bands for assisted active motion, stretch straps for gentle overhead and behind-the-back mobility, and eccentric mobility drills that combine flexibility with control. Proprioceptive challenges, such as ball stabilization on a wall or dynamic weight shifts in quadruped, may be added to refine movement quality and prepare the patient for daily tasks or recreational activity. Functional mobility tasks such as grooming, reaching overhead to shelves, or putting on a jacket can now be used therapeutically as both assessment and training opportunities.

Patient education remains an essential component of mobility management throughout all phases. Patients must understand the importance of regular, low-load movement multiple times per day rather than infrequent, forceful stretching. Education should also include recognizing the difference between expected soreness and problematic pain, using cold therapy proactively, and maintaining good posture during daily tasks. Clinicians should provide clear home programs that outline not only what exercises to perform, but how often, how long, and what to expect during and after each session.

Pain and mobility management following subacromial balloon arthroplasty should be personalized, phase-specific, and symptom-informed. From early cold therapy and positioning strategies to progressive stretching with dowels, pulleys, and functional reach tasks, each intervention must be matched to the patient's healing stage and functional readiness. By reducing pain effectively and restoring range of motion systematically, clinicians can support neuromuscular retraining, improve independence, and help patients achieve lasting gains in shoulder function and quality of life.

Section 4 Key Words

Neuromuscular Adaptation – The retraining of muscle activation and coordination patterns to restore functional movement, especially in the absence of a repaired rotator cuff

Phased Rehabilitation Approach – A structured progression through early, middle, and late recovery stages, each with specific goals aligned to the healing timeline and implant function

Progressive Loading – The controlled increase of exercise difficulty or resistance to build strength and function without exceeding tissue or implant tolerance

Section 4 Summary

Post-operative rehabilitation following subacromial balloon arthroplasty requires a strategic and adaptive framework that supports the patient's functional goals while accounting for the unique biomechanical environment created by the implant. Rehabilitation is not focused on tendon healing but instead centers on restoring efficient movement through neuromuscular re-education, motor control, and postural stability. A phase-based progression including early protection, mid-phase activation, and late-phase integration ensures that interventions are aligned with the implant's degradation timeline and the shoulder's evolving capacity to load and move. Clinicians must apply both time-based and symptom-guided criteria to determine when and how to progress exercises, always prioritizing movement quality, pain-free range, and functional relevance. With thoughtful programming, patient education, and close monitoring, subacromial balloon arthroplasty rehabilitation can result in significant gains in pain reduction, mobility, and quality of life. Ultimately, the success of this procedure depends as much on the rehabilitation process as on the surgical intervention itself.

Section 5: Functional Progression and Goal-Setting

Rehabilitation after subacromial balloon arthroplasty ends in a crucial stage, the transition from early recovery to functional reintegration. As patients move past the initial healing and mobility phases, the focus shifts toward rebuilding strength, restoring control, and enabling a safe return to work, daily life, and recreational activities. This functional progression phase is highly individualized, guided by both clinical benchmarks and the patient's personal goals. In this stage, rehabilitation becomes a bridge from medical recovery to meaningful activity, reinforcing not only musculoskeletal recovery but also autonomy and confidence.

Subacromial balloon arthroplasty is uniquely positioned among shoulder surgeries in that it does not require biological healing of the rotator cuff, but instead offers a temporary mechanical solution by restoring the subacromial space and optimizing deltoid function. As the biodegradable spacer gradually breaks down, the shoulder must rely increasingly on neuromuscular control, proprioceptive accuracy, and muscular endurance. Therefore, late-phase rehabilitation demands targeted strategies that prioritize functional strength, movement quality, and progressive return to activity without compromising joint stability.

Building Strength and Function

References: 22, 27

A central pillar of this phase is progressive resistance training, which should be introduced systematically and in alignment with the patient's capacity for load tolerance. During the early portion of the late phase (weeks 10 to 16), resistance exercises should begin at low intensity using light weights or resistance bands. Key focus areas include the deltoid, trapezius, serratus anterior, and rhomboids, as these muscles contribute significantly to glenohumeral elevation and scapular control in the absence of rotator cuff support. Isolated strengthening of the deltoid, such as resisted scaption or standing shoulder flexion, helps reinforce the primary elevation force, while scapular-focused movements such as prone horizontal abduction or wall Y raises support proximal stability.

As patients demonstrate improved control and minimal post-exercise soreness, resistance can be gradually increased in both volume and complexity. Closed-chain exercises such as wall push-ups or quadruped weight shifts can be implemented to provide safe joint compression with minimal shear. These movements challenge strength and control in functional positions while offering proprioceptive feedback. Eccentric training, which involves controlling the lengthening phase of muscle contraction, is particularly valuable during this phase for developing shoulder stability under dynamic load. Examples include eccentric shoulder flexion with a dowel or slow lowering in scaption with resistance.

Neuromuscular control and proprioceptive re-training are critical elements of this phase. Because the shoulder joint relies heavily on muscular coordination in the absence of structural integrity, proprioceptive deficits can persist unless explicitly addressed. Rehabilitation should integrate drills that challenge joint position sense, dynamic balance, and reaction timing. Ball-on-wall stabilization exercises, rhythmic stabilization using perturbations, and variable surface training help improve neuromuscular responsiveness. Incorporating trunk and core engagement, such as in diagonal chop lifts or resisted trunk rotation with arm movement, ensures the entire kinetic chain supports shoulder function, which is particularly important for return to higher-level activities.

Throughout this period, clinicians must closely monitor movement quality. Exercises that provoke compensatory strategies, such as shoulder hiking or trunk leaning, should be modified or regressed. The focus remains on control, precision, and endurance rather than maximal output. Sets and repetitions should follow a high-rep, low-load format initially, progressing to more challenging patterns only as form remains intact across volume.

Return to Work and Activity

References: 25, 27–29

As patients begin to return to work and recreational activity, rehabilitation should become increasingly goal-directed. This requires ongoing dialogue between patient and clinician to establish, refine, and work toward specific functional goals. For some individuals, goals may center around regaining independence in grooming, dressing, or light housekeeping. Others may have vocational goals, such as returning to manual labor, caregiving, or overhead lifting. Still others may seek a return to sport or recreational hobbies, such as swimming, golf, or tennis. Each goal requires a nuanced understanding of the physical demands involved and the necessary preparatory steps in the rehabilitation process.

Goal-setting should be individualized, measurable, and revisited regularly. Outcome measures such as the Disabilities of the Arm, Shoulder and Hand (DASH) score, the Penn Shoulder Score, or simple function-based questionnaires can help quantify progress and motivate adherence. Therapists should break long-term goals into smaller, achievable steps and celebrate benchmarks along the way. For instance, regaining the ability to reach a shelf overhead might be a meaningful short-term goal working towards returning to warehouse work or participating in an overhead sport. Creating this roadmap gives structure to the final stages of rehabilitation and empowers the patient to remain actively engaged in their recovery.

The decision to return to work or sport should be based on well-defined clinical criteria that reflect the patient's readiness, not just the time elapsed since surgery. Pain-free active range of motion to at least 130 degrees in elevation and 40 degrees in external rotation is generally considered a prerequisite. Additionally, the patient should demonstrate strength symmetry of at least 4/5 in the deltoid and scapular stabilizers, stable movement mechanics without compensations, and the ability to complete functional tasks without symptom exacerbation. For higher-demand activities, a period of sport-specific or job-specific simulation training is recommended. For example, an individual returning to carpentry may undergo progressive lifting, overhead positioning, and repetitive task simulations to ensure durability and safety.

Pacing remains essential during this transition. While some patients may feel eager to resume full activity, they must understand the importance of gradually increasing workload to avoid overuse or strain, particularly as the balloon implant degrades and the shoulder adapts to independent function. Clinicians should guide patients through graded exposure, starting with short bouts of light-duty tasks and gradually increasing frequency, intensity, and duration. Incorporating rest, active recovery, and ongoing home exercises into this process helps maintain gains and prevent setbacks.

For patients with low physical demands or primarily sedentary jobs, return to work may occur earlier, with clearance often based on pain-free mobility and functional use of the limb in low-load tasks. In contrast, those in labor-intensive roles, such as mechanics, healthcare workers, or warehouse employees, require more extensive strength and endurance training to meet occupational demands. Likewise, recreational athletes should demonstrate full functional capacity, task-specific performance, and confidence before returning to play. Criteria for return to sport may include successful completion of a return-to-sport test battery, no signs of instability or inflammation after high-level activity, and clearance from both a physical therapist and a surgeon.

Importantly, the success of this final rehabilitation phase depends not only on physical readiness but also on psychological readiness. Fear of reinjury, lack of confidence in the arm, or hesitation during movement can limit functional return even in the presence of adequate strength and range. Therapists should screen for these psychological barriers and incorporate cognitive-behavioral strategies, reassurance, and graded exposure techniques to support the transition. In some cases, referral to a mental health or pain specialist may be appropriate to address persistent fear-avoidance or pain catastrophizing.

Throughout the entire process, education remains a cornerstone. Patients should be counseled on the natural history of the implant, expectations for long-term shoulder function, and the importance of continued maintenance exercises. Reinforcement of proper biomechanics during daily tasks, such as reaching with scapular engagement, lifting with body support, or avoiding overhead loading until cleared, helps ensure sustainability of gains. A final home program should be provided, including progressive strengthening, scapular activation, and mobility work. Check-ins post-discharge can also help reinforce adherence and address emerging challenges.

Adapting the Rehab Plan

References: 13, 25

Rehabilitation following subacromial balloon arthroplasty must be approached with a dynamic, patient-centered mindset. While postoperative guidelines provide a general framework, each patient's response to surgery and rehabilitation is unique. Rigid adherence to protocols can be detrimental if it fails to account for variability in healing, baseline function, comorbidities, and psychosocial factors. Therefore, skilled clinical reasoning is essential to appropriately adapt the rehabilitation plan in real-time. This section focuses on applying clinical decision-making to adjust standard protocols and on identifying and managing delayed progress in a timely, evidence-informed manner.

Using Clinical Reasoning to Adjust Protocols

The foundation of adapting any rehabilitation plan lies in sound clinical reasoning. For patients recovering from SBA, protocols often outline phase-based progression based on expected tissue healing timelines, such as protection (weeks 0–4), controlled mobility (weeks 4–8), and strengthening and functional restoration (weeks 8+). However, individual variations necessitate a flexible interpretation of these timelines.

Clinical reasoning begins with a thorough understanding of surgical details, which may include the patient's rotator cuff integrity, degree of subacromial decompression, concurrent procedures, or deltoid muscle integrity. For instance, a patient with significant fatty infiltration or partial-thickness cuff tears may require a more conservative strengthening timeline compared to someone with better preserved musculature. In contrast, patients with higher functional demands or lower baseline disability may progress more rapidly through early mobility and motor control phases.

Physical therapists should use the patient's current presentation, rather than an arbitrary timeline, to guide decisions. Key indicators such as pain levels (at rest and with movement), inflammation, tissue reactivity, range of motion gains, and quality of movement all inform the appropriate pace of progression. For example, if a patient exhibits guarded movement and increased pain following a recent increase in activity or loading, the therapist may need to regress exercises, modify dosage, or delay progression to more challenging tasks. Conversely, if the patient reports minimal pain, demonstrates good scapular control, and shows consistent range and strength gains, it may be appropriate to progress sooner than the protocol prescribes.

Additionally, therapists must account for comorbidities and whole-person factors. Patients with diabetes, low activity levels, or prior adhesive capsulitis may require modifications to address slower healing, altered pain processing, or greater susceptibility to stiffness. Psychosocial considerations, such as fear of movement, anxiety about reinjury, or low self-efficacy, can also hinder progression, and may require specific therapeutic strategies such as education, graded exposure, and reassurance to support adaptive behavior and reduce threat perception.

Effective communication with the surgical team is also critical. When clinical presentation diverges significantly from protocol expectations, consultation with the surgeon ensures collaborative decision-making and alignment on modifications to precautions or expectations. This team-based approach supports individualized, safe, and effective care.

Identifying and Managing Delayed Progress

Recognizing and responding to delayed progress is a vital aspect of rehabilitation following SBA. While some variation in recovery is expected, persistent deficits beyond anticipated timelines warrant proactive management. Delayed progress may present as stagnant or regressing range of motion, persistent high pain levels, poor motor control, or failure to transition to the next phase of rehabilitation despite adequate time and adherence.

To identify delayed progress, therapists should use both objective and subjective markers. Objectively, range of motion (particularly flexion and external rotation), strength testing, and functional movement assessments can be compared against expected benchmarks at various stages. Subjectively, pain that remains above 4/10 at rest or consistently increases with activity, difficulty sleeping due to shoulder discomfort, or patient-reported inability to perform daily tasks are red flags for slowed recovery.

Once delayed progress is suspected, the first step is to determine the underlying cause. Mechanical issues, such as joint stiffness, soft tissue restrictions, or scapular dyskinesis, may require targeted manual therapy, joint mobilizations, or neuromuscular retraining. Biological factors, such as ongoing inflammation, slow tissue healing, or re-irritation from excessive loading, may necessitate temporary regression in activity intensity or frequency. Patient behavior, such as inconsistent adherence to home exercise programs or fear-driven movement avoidance, can also stall progress and should be addressed with motivational interviewing, education, and goal alignment.

Managing delayed progress involves several core strategies that rely on astute clinical judgment and a flexible, patient-centered approach. The first step is thorough reassessment and refinement of working hypotheses. Therapists should use updated findings to determine potential sources of delay. For instance, if shoulder elevation remains limited despite targeted mobility work, the issue may stem from compensatory scapular kinematics or restricted trunk rotation rather than purely glenohumeral stiffness.

Following reassessment, the rehabilitation plan should be modified accordingly. Adjustments might include reducing exercise volume to control tissue irritability, increasing the frequency of manual interventions to address soft tissue restrictions, reordering clinical priorities—such as focusing on pain modulation before aggressive range-of-motion work—or revisiting patient education to reinforce appropriate expectations and participation.

For patients exhibiting pain-related fear or central sensitization, incorporating progressive desensitization and graded exposure is essential. Gradually introducing feared or painful movements using controlled loading and positive reinforcement can help restore confidence and reduce pain-related avoidance behaviors. In addition, adjunctive modalities such as TENS, moist heat, ice, or kinesiotaping may provide short-term symptom relief. While these should not replace active rehabilitation, they can be helpful tools when strategically integrated into a comprehensive plan.

In some cases, progress may plateau despite well-executed plan modifications. When this occurs, referral to the surgeon or referring provider should be considered, particularly if there are signs of mechanical complications, potential reinjury, or unaddressed pathologies such as biceps tendon involvement or acromioclavicular joint dysfunction.

Throughout the process, it is also important to engage in patient-centered reframing. Therapists should normalize the variability of healing timelines and reinforce that slower progress does not indicate failure. Setting realistic expectations, celebrating small but meaningful gains, and shifting focus to achievable short-term goals can promote resilience and continued participation in the rehab process.

Finally, meticulous documentation and communication are essential. Therapists should clearly record reassessment findings, changes to the plan of care, and patient responses. When collaboration with other healthcare professionals is needed, communication should be timely, include relevant clinical reasoning, and contribute to a coordinated and effective treatment approach.

Adapting the rehabilitation plan after subacromial balloon arthroplasty demands a thoughtful balance of evidence-based guidelines and individualized clinical judgment. Effective physical therapists must be vigilant in observing the patient's responses, willing to challenge assumptions, and proactive in refining the plan to promote optimal outcomes. Delayed progress should not be viewed as a setback, but rather as a clinical cue to re-engage problem-solving, refine treatment strategies, and ensure that rehabilitation remains on the most productive path possible for that individual.

Recognizing Complications and Red Flags

References: 30, 31

While subacromial balloon arthroplasty has shown promising outcomes in improving shoulder function and reducing pain in select populations, it is not without risks. As rehabilitation professionals, physical therapists play a critical role in identifying potential post-operative complications and determining when a patient's progress warrants further medical evaluation. Early recognition of red flags such as balloon migration, persistent pain, and shoulder stiffness is essential to avoid long-term dysfunction and optimize outcomes.

Balloon Migration, Persistent Pain, and Stiffness

One of the most notable complications unique to SBA is balloon migration. The balloon spacer, typically made from a biodegradable material, is inserted into the subacromial space to create a mechanical buffer between the acromion and humeral head. Ideally, it remains in position long enough to allow deltoid reconditioning and improved glenohumeral mechanics. However, in some cases, the spacer may migrate from its intended position prematurely. This can occur due to excessive or early loading, capsular insufficiency, or mechanical disruption during rehabilitation.

Balloon migration may present clinically as a sudden increase in shoulder pain or dysfunction, particularly when it occurs during phases of rehabilitation that involve progressing loading or overhead movements. Patients may report catching or shifting sensations, a loss of previously gained range of motion, or difficulty with basic movements that had been improving. Visual confirmation of migration typically requires imaging, such as ultrasound or MRI, but the therapist may be the first to detect a change through clinical observation and patient-reported symptoms. When suspected, balloon migration should prompt immediate referral to the surgical team for reassessment.

In addition to migration, persistent pain is another complication that warrants close attention. While some degree of discomfort is expected in the early phases of recovery, particularly during movement initiation or stretching exercises, pain that remains high in intensity (typically >4/10 at rest or worsening with time) or fails to improve over several weeks may signal a complication. This can be due to balloon malfunction, improper placement, local inflammatory response, or unrelated pathologies such as biceps tendon irritation or acromioclavicular joint involvement. In some cases, persistent pain may also stem from central sensitization or altered pain processing, which may require a multidisciplinary approach to address.

Shoulder stiffness, although a common and often manageable post-operative symptom, may also serve as a red flag when it is disproportionate or unresponsive to intervention. Patients experiencing significant limitations in both passive and active range of motion despite appropriate mobilization strategies may be developing adhesive capsulitis or other forms of capsular restriction. Contributing factors such as diabetes, prior shoulder pathology, or prolonged immobilization increase this risk. The therapist should differentiate between protective muscle guarding, capsular stiffness, and mechanical blockages through clinical testing and movement assessment. A plateau in progress lasting beyond the expected timeframe for mobility restoration, typically 6 to 8 weeks, should raise concern and may warrant a change in treatment strategy or further medical input.

Indicators for Re-Evaluation or Surgical Referral

Therapists must be vigilant in monitoring for clinical indicators that suggest the need for re-evaluation or surgical referral. These include objective findings and subjective reports that fall outside the expected course of recovery or suggest a mechanical or biological issue that cannot be addressed through conservative measures alone.

Key indicators that may warrant re-evaluation or surgical referral include a sudden loss of previously achieved range of motion without a clear cause or recent injury, particularly when accompanied by increased pain or altered joint mechanics. Unresolved or escalating pain is also a red flag, especially when the pain disrupts sleep, persists at rest, or worsens despite a reduction in physical activity. Mechanical symptoms, such as catching, grinding, or a shifting sensation within the shoulder joint, should raise concern, particularly if they are associated with loss of motion or increased discomfort. Neurological signs, including numbness, tingling, or radiating pain into the arm or hand, may suggest nerve irritation or compression potentially related to balloon displacement or other postoperative complications. A lack of functional improvement beyond 8 to 12 weeks, despite consistent participation in therapy and adherence to home programming, is another indicator that the rehabilitation process may not be progressing as expected. Finally, clinical suspicion of balloon migration, especially when supported by changes in deltoid contour, palpable irregularities, or the patient reporting feelings of instability, should prompt immediate communication with the surgical team.

When any of these signs are present, the physical therapist should initiate prompt communication with the referring surgeon or provider. This should include a concise summary of the patient's progress, specific findings of concern, and any actions already taken to address the issues within the scope of physical therapy. Early involvement of the surgical team allows for timely imaging, medical management, or potential surgical intervention to address the complication.

It is also important to consider that not all deviations from expected progress are due to mechanical failure or complications. Psychosocial factors, such as kinesiophobia, depression, or unrealistic expectations, can mimic or compound clinical presentations. Therefore, a holistic view of the patient's experience, including emotional well-being, sleep patterns, and perceived self-efficacy, should inform the therapist's decision to refer.

Recognizing complications and red flags following subacromial balloon arthroplasty requires a combination of vigilant monitoring, skilled clinical assessment, and timely communication with the surgical team. Balloon migration, persistent pain, and unresolved stiffness should never be dismissed as normal recovery variance. Instead, they should prompt a structured clinical inquiry to determine the most appropriate course of action. Physical therapists are uniquely positioned to detect early warning signs and to advocate for the patient's best interests through collaborative, proactive care.

Section 5 Key Words

Progressive Resistance Exercises – A systematic approach to increasing load and intensity in strengthening movements while monitoring pain and form

Proprioceptive Training – Rehabilitation drills designed to enhance joint position sense, coordination, and stability under dynamic conditions

Functional Goal-Setting – Individualized planning of meaningful recovery targets based on patient needs, lifestyle, and occupational demands

Section 5 Summary

The final stage of rehabilitation following subacromial balloon arthroplasty is a dynamic and patient-driven process that blends evidence-based strengthening, proprioceptive retraining, and individualized goal setting. It is not enough for a patient to be pain-free in a clinic setting; they must be functionally capable in their chosen environment. This phase restores not only strength and mobility but also independence, confidence, and quality of life. By aligning progression with tissue healing, implant behavior, and personal goals, clinicians can help patients transition from recovery to full participation in work, play, and life with lasting success.

Case Study 1

John M. is a retired 67-year-old contractor who underwent arthroscopic subacromial balloon arthroplasty (SBA) on his right shoulder four weeks ago for a massive, irreparable rotator cuff tear. Prior to surgery, he had experienced years of shoulder pain and functional decline despite conservative management, including physical therapy and corticosteroid injections. His surgical team determined SBA was appropriate given his desire to remain active and avoid a more invasive procedure such as reverse total shoulder arthroplasty. John has a medical history of well-controlled Type 2 diabetes and mild cervical spondylosis. His pre-injury lifestyle included recreational golf and woodworking. During the initial postoperative period, John progressed well through the protective phase. He was compliant with his home exercise program, which consisted of pendulum exercises, passive-assisted shoulder flexion, and elbow/wrist mobility drills. He reported mild soreness following therapy, which resolved quickly. Range of motion had been gradually improving.

At his fifth therapy session (week 4 post-op), however, John reports a new “shifting” sensation in the shoulder when lying on his side and increased discomfort during daily activities like reaching for a seatbelt. He also notes a decrease in his ability to lift his arm, compared to the previous week.

John’s current objective examination reveals a decrease in active-assisted range of motion, with shoulder flexion now limited to 85 degrees (previously 100 degrees) and external rotation in neutral reduced to 15 degrees (previously 25 degrees). He reports a dull ache rated at 4 out of 10 at end range. Palpation reveals increased subacromial tenderness, and visual observation suggests the deltoid contour appears less full than in previous sessions. Strength testing was deferred due to post-operative precautions, and a brief neurological screen was unremarkable.

Reflection Questions

1. What clinical concerns does this change in presentation raise, and what hypotheses should you consider?
2. What immediate steps would you take in managing this patient's care at today's session?
3. What specific indicators suggest the need for surgical re-evaluation?
4. How might John's comorbidities influence his healing and clinical progression?
5. How would you approach patient education and reassurance during this visit?

Responses

1. John's sudden decline in shoulder mobility, combined with his report of a "shifting" sensation and visible changes in deltoid contour, raises concern for balloon migration, one of the more specific complications following SBA. Other differential considerations include subacromial bursitis, adhesive capsulitis, or altered neuromuscular control. However, the combination of mechanical symptoms, pain increase, and visual asymmetry leans heavily

toward a structural issue such as balloon displacement or improper degradation.

2. The therapist should pause any progression in loading or stretching exercises and instead focus on a comprehensive reassessment. Document the specific loss of ROM, symptom changes, palpation findings, and deltoid asymmetry. Do not initiate new or aggressive movements that could exacerbate symptoms. The therapist should then initiate communication with the surgical team, sharing clinical observations and concerns, and request guidance on next steps, including possible imaging.

3. Several red flags in John's presentation support the need for surgical re-evaluation. These include a sudden decrease in active-assisted range of motion, newly reported mechanical symptoms such as a shifting sensation, and increased pain at end range despite a reduction in activity. Additionally, the altered deltoid contour raises concern for possible balloon displacement, and the lack of continued progress despite good compliance with the rehabilitation program further underscores the need for medical reassessment. Collectively, these findings suggest a potential mechanical complication that extends beyond the scope of conservative rehabilitation and warrants prompt surgical evaluation.

4. John's Type 2 diabetes is a relevant factor, as it can delay tissue healing and increase risk for post-operative stiffness or capsular contracture. It can also influence the inflammatory process, potentially exacerbating discomfort or slowing resolution of swelling. While diabetes might explain some delayed progression, the sudden nature of John's symptoms and the mechanical quality of his complaints indicate that it is more than just a metabolic condition at play.

5. Patient communication should be clear, supportive, and confidence-building. The therapist might say something like, “John, it’s not uncommon for recovery to fluctuate, but the shifting feeling you’ve noticed, and today’s range of motion changes are things we want to look into more closely. I’m going to reach out to your surgeon to make sure everything is healing as expected. For now, we’ll back off any movements that are bothering you and focus on comfort.” Reinforcing that the therapist is acting out of caution and professionalism helps reduce fear and maintain trust in the care process.

Case Study 2

Emily R. is a 58-year-old recreational mountain biker and avid yoga practitioner who underwent subacromial balloon arthroplasty eight months ago for a massive, irreparable rotator cuff tear in her left (non-dominant) shoulder. Prior to surgery, she experienced years of gradually worsening shoulder pain and functional limitations that interfered with overhead movements, load-bearing positions, and her ability to ride confidently on technical terrain. She had tried physical therapy, activity modification, NSAIDs, and two corticosteroid injections without lasting relief. Her orthopedic surgeon recommended SBA as a minimally invasive option that would preserve her activity levels while avoiding the higher risk and lifestyle disruption associated with reverse total shoulder arthroplasty.

Emily progressed well through the early and middle phases of rehabilitation. Her pain diminished substantially within the first three months, and she regained functional passive and active-assisted range of motion. She was diligent with her home program, attended physical therapy consistently, and gradually returned to weight-bearing positions during yoga and modified handlebar loading on her bike.

By six months, she had resumed most recreational activities at a lower intensity, though she remained cautious with overhead lifting and resisted pulling.

At eight months post-op, Emily returns to therapy reporting a plateau in progress. She states that while her pain remains low, her shoulder continues to feel "weak and unreliable," especially during more dynamic movements like lifting her bike over obstacles or transitioning into downward dog. She expresses frustration that her performance hasn't returned to pre-injury levels, despite her commitment to rehab. Objectively, her shoulder active range of motion is functional with only mild end-range restrictions, but strength testing reveals persistent deficits in external rotation and abduction. There is no evidence of scapular dyskinesis, and her core and thoracic mobility appear sufficient. Her neurologic screen is normal, and palpation reveals mild residual tenderness along the anterior shoulder and deltoid.

Emily is pain-free with most activities of daily living, but her return to full recreational capacity is limited by perceived instability, endurance deficits, and inconsistent neuromuscular control under load. Her case highlights the challenge of restoring high-level function after a procedure designed primarily for symptom relief, rather than full biomechanical restoration.

Reflection Questions

1. What are the key considerations when managing an active patient in the chronic phase following subacromial balloon arthroplasty?
2. How can a therapist approach strength deficits and movement hesitancy in a patient who has otherwise recovered well?
3. What role does patient education and expectation-setting play in this stage of recovery?

4. What clinical strategies might help Emily regain confidence in her shoulder and continue progressing toward her activity goals?

Responses

1. In the chronic phase, the primary goals shift from basic mobility and pain management to addressing higher-level strength, endurance, and neuromuscular control. For active individuals like Emily, SBA may alleviate pain and improve function, but it does not restore rotator cuff integrity. This limitation can lead to lingering deficits in force production, especially in dynamic or load-bearing scenarios. Therapists must consider whether ongoing impairments stem from residual muscular weakness, compensatory movement patterns, or reduced proprioception and control. It's also critical to differentiate between true biomechanical limitations and fear-based movement hesitancy.

2. Although Emily has progressed well in terms of pain and mobility, her persistent weakness and instability during more demanding tasks likely reflect the deconditioning of the deltoid and periscapular musculature, along with potential neuromuscular inhibition. A progressive strengthening program focused on closed-chain loading, scapular stabilization, and multi-planar resistance exercises is appropriate. Movement hesitancy can be addressed through graded exposure—starting with low-load versions of challenging positions (such as modified plank or quadruped loading) and gradually increasing complexity. Reintroducing sport-specific tasks like bike lifting or trail obstacle navigation in a controlled environment can also rebuild trust in her shoulder.

3. Emily's case underscores the importance of setting realistic expectations for patients undergoing SBA, especially those with high functional demands.

While many patients return to recreational activity, full return to pre-injury performance may require ongoing effort and adaptation. Educating Emily about the nature of the balloon implant, that it provides temporary mechanical support but does not restore tendon function, can help reframe her current limitations not as failures, but as part of a long-term neuromuscular retraining process. Validating her frustration while highlighting the progress she has made is key to maintaining engagement.

4. To help Emily regain shoulder confidence and progress toward her goals, her rehab should be reframed around performance-based milestones rather than generic timelines. Implementing functional testing (such as closed kinetic chain upper extremity stability test, Y-Balance Test for UE) can provide measurable data and highlight gains. Incorporating unstable surfaces, dynamic reach tasks, and plyometric-style drills can enhance control and confidence under variable conditions. Additionally, integrating her personal activities, such as yoga poses and mountain biking mechanics, into the rehab framework will enhance relevance and motivation. A phased return-to-sport plan, with graded load monitoring and specific skill practice, may help close the gap between “pain-free” and “fully capable.”

Case Study 3

Mark T. is a 62-year-old retired firefighter and recreational weightlifter who underwent subacromial balloon arthroplasty three months ago for a massive, irreparable rotator cuff tear in his dominant (right) shoulder. Before surgery, Mark experienced progressive shoulder pain that significantly limited his ability to press, push, or lift overhead. Conservative treatment including injections, manual therapy, and modified training yielded only short-term relief. Given the extent of the tear and Mark's desire to avoid a full shoulder replacement, SBA was chosen as a joint-preserving solution to reduce pain and maintain his ability to stay active.

During his three-month follow-up, Mark reports that his resting pain has significantly improved and he is able to perform most daily activities without discomfort. He has returned to gym-based training with modifications avoiding overhead presses and working with reduced loads. However, he notes difficulty performing incline pressing movements and continues to feel unstable when lowering weights under control. He describes his shoulder as feeling "weak at the bottom of the movement" and admits to some apprehension when loading the joint under resistance. Objective testing shows nearly full active range of motion with mild compensatory scapular motion at end range, and moderate weakness in external rotation and horizontal abduction. Neurological exam is normal, and there are no signs of mechanical symptoms or surgical complications.

Reflection Questions

1. What are the key rehab priorities at this stage of recovery for a patient like Mark?
2. How would you address his strength deficits and instability with return to resistance training?
3. How can you help Mark safely continue gym-based activity while progressing his rehab goals?

Responses

1. At this stage, Mark is entering the late strengthening and early functional reintegration phase. The focus should be on restoring strength, particularly in the deltoid, rotator cuff-surrounding musculature, and scapular

stabilizers, while building load tolerance in pressing and reaching patterns. Reducing compensations and promoting controlled, symmetric motion should also be emphasized.

2. Mark’s weakness in horizontal abduction and external rotation suggests residual deficits in posterior shoulder control, which are essential for safe pressing mechanics. Begin with controlled, low-load exercises such as sidelying ER, prone T’s, and banded horizontal abduction. Incorporating tempo-based eccentric work can help improve control during the lowering phase of pressing movements. Education on proper scapular positioning and trunk engagement during lifts is also critical to reduce strain and improve perceived stability.
3. Mark should be encouraged to continue modified gym workouts that avoid provocative positions (deep incline or overhead pressing) and use neutral-grip variations to reduce stress. Landmine presses, cable rows, and push-up progressions are good alternatives. As strength and control improve, exercises can be gradually progressed in range, resistance, and speed. Providing a structured return-to-lifting protocol with specific benchmarks will help maintain motivation while reducing reinjury risk.

Conclusion

Subacromial balloon arthroplasty offers a promising and less invasive option for patients with massive or irreparable rotator cuff tears. As this procedure becomes more widely adopted, physical therapists and physical therapist assistants play a vital role in guiding recovery and improving patient outcomes. This course has provided participants with a strong understanding of the procedure, its impact on shoulder function, and how to create effective rehabilitation plans tailored to each patient. Through a blend of clinical reasoning, real-world case examples, and practical strategies, learners are prepared to manage pain, restore mobility, and build functional strength throughout the recovery process. With these tools, PTs and PTAs can support patients in returning to their daily activities with confidence and improved quality of life.

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