

Conservative Approach for Restoring  
Subacromial Impingement SyndromeThiruvarangan S<sup>1\*</sup>, Srigrishna P<sup>2</sup> and Saravanan V<sup>3</sup><sup>1</sup>Department of Physical Medicine, Base Hospital, Srilanka<sup>2</sup>Department of Orthopaedic Surgeon, Teaching Hospital Jaffna, Srilanka<sup>3</sup>Department of Orthopaedics, Teaching Hospital Jaffna, Srilanka

## Article Information

Received date: Feb 21, 2019

Accepted date: Mar 20, 2019

Published date: Mar 22, 2019

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**Keywords** Subacromial impingement  
syndrome; Shoulder pain; Conservative  
approach; Rotator cuff lesion

## Abstract

The subacromial impingement syndrome is a collective cause of shoulder pain it takes place due to the soft tissue reside in the subacromial space. This occurs by mechanical compression of the soft tissues predominantly on the supraspinatus, long head of biceps tendon, subacromial bursae and superior portion of the articular capsule between the greater tuberosity and the under surface of the anteroinferior edge of the acromion. The root cause of this condition has been contested over the last couple of decades nowadays, many studies agree that this condition is multifactorial and management includes physiotherapy, injections, and surgery in some selected patients. This article aims to provide an overview of the clinical features and pathogenesis of subacromial impingement syndrome also discuss the widely accepted non-invasive physiotherapy interventions approach for recovering the subacromial impingement syndrome effectively and efficiently based on other studies.

## Introduction

Shoulder pain is very common complaints among adults population between 7% and 34% suffer from shoulder pain during their lifetime [1]. It is associated with a negative impact on both personal and national levels. It decreases the quality of life due to personal suffering and subsequently economic impact on health care services. The resultant cost and absence from work along with shoulder pain is a social concern [2]. Shoulder pain due to subacromial impingement syndrome (SIS) is the most prominent reason. SIS is that the soft tissue entrapping in the subacromial space, which is built by the under the surface of the acromion, head of humerus and coracoacromial ligament. SIS is caused by various factors resulting from impingement on the rotator cuff tendon, the long head of biceps and occasionally the overlying subacromial bursa and superior portion of capsule against the anterior edge of the acromion and its associated coracoacromial arch [3]. Pain is located around the acromion and lateral side of the upper shoulder. It is exaggerated by overhead physical activity and pain gets worse at night. In the majority of cases, the prevalence of shoulder pain and rotator cuff dysfunction get severe and worse with aging among women population. The shoulder pain symptomatology can be overlapped by many findings and various conditions however, successful prognosis in related to subacromial impingement syndrome is dependent on precise diagnosis. It can be brought by detailed knowledge of the regional anatomy, the biomechanics of shoulder motion and the accurate interpretation of the pathology determined through a detailed history, comprehensive physical examination and diagnostic studies. A study reveals that conservative interventions approach for shoulder impingement syndrome recovery of the problem in 70-90% of cases [4].

## Discussion

## History

The condition is defined as all non-traumatic, usually unilateral, shoulder problems that cause pain, localized around the acromion, often worsening during or subsequent to a lifting of the arm. Neer (1972) developed the concept of "impingement syndrome" and described the syndrome as a mechanical impingement of the rotator cuff tendons under the anterior-inferior of the acromion the humeral head occurs when the shoulder is positioned in flexion and internal rotation [5]. Furthermore, he established a classification system based on cadaveric dissections, clinical and surgical experiences in 1983 that defines three progressive stages in the spectrum of rotator cuff impingement that follows a pattern of severity. Stage I is depicted by acute inflammation, oedema and hemorrhage in the rotator cuff. In stage II, represents a progression of stage I to thickening of the rotator cuff tendon progresses to fibrosis and tendinitis. As this condition progresses, it may lead to mechanical disruption of the rotator cuff tendon and to changes in the coracoacromial arch with osteophytes along anterior acromion in stage III.

## Etiology

One of the main causes of shoulder pain is alternated scapular anatomical position due to rotator cuff dysfunction and consequently leads to subacromial impingement syndrome associated with pain and stiffness. Postural abnormality eventually develops cervical lordosis and/or excessive thoracic kyphosis changes the normal resting position of the scapula as a result of excessive protraction and acromial depression [6]. The most collective origin is the muscle imbalance between the shoulder girdle agonist and antagonist's muscles cause to varying the anatomical position and coordination of scapular movements timing due to muscular inhibition and glenohumeral proprioception [7]. In few cases, anatomical disruption due to clavicular fractures or resections can shorten or angulate the clavicle that altering the ability of the clavicle to posteriorly rotate with overhead motions because posterior clavicular rotation allows the initial and final 30° of scapula-humeral rhythm to complete overhead motions. Furthermore, shortening of pectoralis major can restrict posterior clavicular motion thereby affecting normal scapular movement. Moreover, acromioclavicular joint injuries, acromial morphology and pectoralis minor or short head of biceps muscular contracture or tightness can anteriorly tilt the scapula due to their attachments to the coracoid process can narrow the natural subacromial space and consequently cause to impingement to occupying soft tissues in the space [8]. In addition to that and lack of capsular flexibility, especially, posterior capsule tightness creates an obligatory anterior and superior translation of the humeral head and loss normal glenohumeral joint play arthrokinematic and eventually develop to SIS [9].

## Clinical Presentation

The shoulder pain is a most often described among the musculoskeletal disorders and its symptoms frequently insidious type but they may not offer any previously reported trauma and no any history of radicular-like distribution along the upper extremity of the affected shoulder side upper limb. In a significant number of symptomatic patients typically complain of pain to the anterolateral acromion and/or the posterosuperior aspect of the shoulder, pain along the upper trapezius. The pain may be quite severe at night, exacerbated by lying down on the affected shoulder or sleeping with overhead and the pain is triggered by reaching and lifting overhead functional activities.

## Functional anatomy

The shoulder joint is characteristically unstable because of disproportion between the large humeral head and the small shallow glenoid fossa. Minimal bony stability in the shoulder allows a wide range of motion. Shoulder joint stability is built by both static and dynamic stabilizers. The static stabilizer is built up from articular morphology, glenoid labrum, joint capsule, glenohumeral ligaments and inherent negative pressure of the joint. Dynamic stabilizers comprise the rotator cuff muscles, the long head of biceps muscle tendon other shoulder girdle muscles such as pectoralis major, rhomboid, latissimusdorsi and serratus anterior [10]. The rotator cuff muscles provide dynamic stabilization to the humeral head in the glenoid fossa by forming a force couple with the deltoid to allow elevation of the arm. This force couple control for 45% of abduction strength and 90% of external rotation strength [11]. A stiff

shoulder present inadequate capsular flexibility and changed muscles function in order to re-establish harmonious movement within the shoulder complex the therapist must rehabilitate the connective tissue extensibility and restore normal muscles function [12]. The biomechanical viewpoint of the shoulder emphasis the synchronized movement of four joints: such as glenohumeral, scapulothoracic, sternoclavicular and acromioclavicular in any shoulder full range of motion [13]. This joint movement has been described as the joint arthrokinematics, which is described rolling, spinning and sliding in different directions in the joint surfaces according to concurrent, as the bone moves through the body planes. Normal arthrokinematic movements occur only in the availability of normal periarticular connective tissue, integrity, extensibility and normal tension relationship muscles function [14].

## Pathomechanics and pathogenesis

The subacromial space is determined by superiorly the anterior edge and bottom of the anterior third of the acromion, coracoacromial ligament and the acromioclavicular joint and inferiorly the humeral head. The soft tissues that occupying in the subacromial space are supraspinatus, long head of the biceps brachii tendon, subacromial bursa and the superior portion of the capsule. One or all of these soft tissues may be affected by the narrowing of subacromial space. The main pathology is inflammation and degeneration of the rotator cuff occurs as a consequence of mechanical compression under subacromial space. As per the compression, the lesion is generally characterized into extrinsic and intrinsic impingement syndrome [15].

**Extrinsic Compression:** There is an ambiguous regarding the accurate location of the extrinsic compression source. A study revealed that impingement occurs between the lateral acromion and the humeral head in the middle arc of abduction [16]. Nonetheless, Neer discovered spurs and excrescences undersurface of the anterior acromion. Thus, he concluded that impingement of the soft tissues occupying the space is possible anterior not lateral and consequently caused to the pathological changes. Moreover, Neer explained that this pathomechanics may develop due to the morphology of acromion [4]. In the same way, a study labeled differences in acromial size and shape that contribute to SIS. Three different morphology of the acromion is identified. Type I is flat, type II is curved and type III is hooked anteriorly [17]. A research study suggested that repetitive contact and bending of the coracoacromial ligament may lead to degenerative changes, including proliferative acromial spurs [18]. Another study revealed that the anatomic features of the coracoacromial ligament may play a role in the development of the impingement and also identified two distinct ligament bands; an anterolateral and posteromedial band. Spurs were commonly found in the anterolateral band [19].

**Intrinsic Compression:** The intrinsic factors that likely lead to rotator cuff failure because mainly diminished vascular supply. In 1934, Codman first described a critical zone in the supraspinatus tendon where a tenuous blood supply exists. The supraspinatus tendon receives its blood supply from the suprascapular and anterior humeral circumflex vessels and has an avascular zone at its insertion site [20]. In a cadaveric study discovered a hypovascular or a critical zone close to the insertion of the supraspinatus tendon into the humeral head. Furthermore, the study concluded that the poor vascularity of the

tendon in this area could be a significant factor in the pathogenesis of degenerative rotator cuff [21]. Benson et al. recounted a study claiming to inspect the incidence of tissue hypoxia and apoptosis at different stages of tendinopathy and tears of the rotator cuff. The authors stated evidence of apoptosis and hypoxic damage to the rotator cuff in the shoulder with impingement and tears [22]. Another study contested from their study results that primary failure of the rotator cuff mostly is caused by eccentric tension overload rather than by impingement from an aberrant acromial shape [23].

### Clinical diagnosis

A thorough history, physical examination and appropriate imagining are crucial for accurate diagnosis of impingement.

### Physical Examination

After gaining the medical history, a comprehensive physical examination should be carried out ideally the patient need to wear appropriate clothes to thoroughly assess by a systemic approach. It contains observing posture, soft-tissue inspection, palpation, the range of motion, strength testing, neurologic assessment and sensitive; specificity shoulder tests [24,25]. The initial assessment is accomplished by observing posture at plump line standing posterior to anterior view with the patient's arm side of the trunk at rest. Next, the evaluation of the quality of motion is done while asking the subject for performing overhead shoulder motion in ascending and descending phases to observe the scapular motion because deviations typically present in the descending phase during eccentric lowering. The altered scapula-humeral rhythm can be identified accurately by comparing the contralateral scapula. The constancy of the sternoclavicular and acromioclavicular joints should be evaluated and also examined the clavicle to detect any angulation following that the coracoid should be investigated to conclude its position by comparing the opposite side and presence of possible tenderness on its medial border where the pectoralis minor is inserted. The rotator cuff muscle-specific strength test is performed to find out their functional capability such as empty can, infraspinatus and lift-off test for supraspinatus, infraspinatus and subscapularis respectively. There are two provocative tests that are highly sensitive for diagnosing SIS. Firstly, Neer's sign elicits pain with maximum passive shoulder elevation and internal rotation while the scapula is stabilized. Secondly, Hawkins impingement sign in which the arm is placed in 90° of forwarding flexion and then gently rotated into internal rotation. The endpoint of internal rotation is either when the patient experiences pain or when the rotation of scapula is felt or observed by the examiner. Research sophisticated that the diagnostic accuracy of the Neer and Hawkins impingement signs for diagnosing of subacromial bursitis or rotator cuff tears. Both tests have higher sensitivity and specificity for the appearance suggestive of subacromial bursitis and rotator cuff tears [26].

### Investigation

A standard series of x-ray include an anteroposterior, outlet and axillary views. The anteroposterior radiological may illustrate the superior migration of humeral head on the glenoid fossa, outlet view provides visualization of acromial morphology and the axillary view demonstrates evidence of os acromiale, which may lead to secondary impingement. The common radiographic findings related to impingement include acromioclavicular osteoarthritis, acromial osteophytes or sclerosis. Nevertheless, these findings may be present

in asymptomatic individuals. Sonography is another modality to examine the shoulder pathology. The advantages of ultrasound include being non-invasive, rapid, relatively inexpensive and possible to carry out both side in one procedure. Magnetic resonance imaging is the current gold standard for SIA and rotator cuff lesions. This imaging has the capability to assess various pathogenic factors and distinguish from each precisely [27].

### Interventions

Conservative treatments are recommended by many authors for subacromial impingement syndrome. However many findings of these various conditions overlap, therefore accurate diagnosis and analyzed individual biomechanics lead to design rehabilitation Physiotherapy interventions will continue to have an integral role in treating patients with shoulder pain to a recovery of pain-free functional capability in a day to day livings and recreational life. The intervention choice for SIS is an evidence-based and individualized to promote soft tissue healing it allows patients to progress to activity of livings as soon as and safely. Individual's rehabilitation programme will occur based on each patient pathophysiology, their tolerance and response to treatment. Course of physiotherapy interventions emphasis personalized physiotherapy regimen, which includes the elimination of pain, muscle stretching, strengthening and restoration of glenohumeral rhythm/ neuromuscular control. Physiotherapists have been in favour of applying passive joint play manipulation, soft tissue mobilization and correcting the muscular imbalance as an effective means of treating shoulder dysfunction and associated problems such as SIS [28]. The complexity of the shoulder joint function may need interventions in the entire shoulder girdle beyond the glenohumeral joint [29].

The initial goal of the rehabilitation program is that it declines pain through modality use according to the duration of acute or chronic such as cryotherapy or hot respectively and also promote the healing of tendinopathy by applying ultrasound [30]. Meanwhile, maintaining the range of motion in order to prevent adhesive capsulitis which can be brought by passively and actively assisted a pain-free range of motion. Many therapeutic approach that emphasis to restore the muscular imbalance between the agonist and antagonist musculature of the shoulder girdle in each motion. This can be performed by gentle sustained stretching and progressive strengthening techniques. The musculature balance centralizes and approximates the humeral head within the glenoid opposes superior translation of the humeral head during the abduction. If the glenohumeral girdle muscle fails to perform this humeral depression function that leads to narrowing of subacromial space and consequently occupied soft tissues can become impinged [31]. The moderate joint play manual therapy techniques were prescribed anteroposterior glides, long axis distraction and sustained capsular stretches for increasing glenohumeral arthrokinematic motion [32]. Number of authors reveals that conservative management and rehabilitation is important for a successful outcome in 60-90% cases and should be continued for at least 3-6 months longer [33]. A systematic literature review evaluated the role of exercise in treating shoulder impingement. The data demonstrated that exercise has statistically and clinically significant effects on pain reduction and improving function, but not on ROM or strength [34]. Subacromial bursa injection has a diagnostic and therapeutic role as an adjunct to the rehabilitation programme [35].

## Conclusion

This article highlights the positive outcomes of the conservative approach for recovering subacromial impingement syndrome. The conservative approach emphasizes the precise diagnosis and performing an evidence-based physiotherapy rehabilitation regimen, which accentuate pain reduction, restore muscular imbalance and joint play manipulation to achieve the functional range of motion and consistency of ideal scapular thoracic rhythm according to the individual clinical findings and biomechanical analysing to recovery of pain-free functional ability in activity of livings.

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