

# IMPINGEMENT SYNDROME

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The term shoulder impingement syndrome was introduced by Neer (1983) and refers to the compression of rotator cuff i.e. Supraspinatus, Infraspinatus, subacromial bursa and biceps tendon against under surface of acromion, coracoacromial ligaments and AC joint during elevation. This syndrome is characterized by shoulder pain that is exacerbated with arm elevation or overhead activities.

## **EPIDEMIOLOGY, PREVALANCE AND INCIDENCE**

The incidence of shoulder pain in community setting is high, estimated to be 11.2 per 1000 person-years. Chard et al conducted a community survey and found that out of sample of 644 people, 170 (26%) reported shoulder pain with at least 70% subacromial impingement syndrome. A prevalence of 7% has been reported in Swedish population by Jacobsen et al. Morrison et al reported in 2000 that 75% of patient present with rotator cuff tendonitis had underlying impingement of anterior acromion on the supraspinatus tendon and occasionally infraspinatus. Pink reported shoulder pain in 66% of swimmer, 57% of professional pitcher, 44% of collegiate volleyball player and 20% of collegiate javelin thrower. Several authors have implicated the role of acromioclavicular joint pathology in development of impingement syndrome.

## **Theory of Impingement**

- (1) Bio-mechanical theory

Initial 30° of abduction takes place in gleno-humeral joint. Then movement takes place at gleno-humeral and scapulo-thoracic joints at 2:1 ratio. Elevation of scapula results from the combined movement of SC joint, clavicular rotation and minimal movement at AC joint. At about 60° of abduction there must be external rotation of humerus to move the suprahumeral structures away from the coraco-acromial arch in order to avoid impingement. Impairment of shoulder external rotation/scapular motion may result into Impingement.

Unbalanced force couple between rotator cuff and deltoid, serratus anterior and trapezeus disturbs the normal shoulder girdle movement and results into Impingement syndrome.

(2) **Anatomical theory**

The space between greater tubercle and coracoacromial arch is fixed. Reduction of its size due to fracture greater tubercle, AC joint arthritis etc. or increase in the volume of its content due to oedema, fibrosis, calcific deposit etc.

(3) **Vascular theory**

Main supply to supraspinatus is the acromioacromial artery, which is sometimes absent. Continued overhead activities with the discomfort without rest does not allow it to heal and results into chronic/degenerative tendonitis due to its relative avascularity.

**Stages of Impingement Syndrome:**

Neer described the three classical stages of impingement.

**Stage-I** involves reversible changes such as edema and hemorrhage of the bursa and cuff is typical in persons under twenty-five years old.

Impingement – Micro trauma – Inflammation/ Edema – increased volume of the contents – Further impingement - edema and hemorrhage

Complaint of toothache like of discomfort following activities, relieved in rest. Impingement sign is positive and Painful arc is present.

**Stage-II** involves irreversible changes such as fibrosis and tendonitis of the rotator cuff, and typically occurs in persons who are twenty-five to forty years old. Collection of inflammatory exudates within its sheath impair circulation, giving rise to gradual degenerative tendonitis, characterised by restriction of movements and crepitus. The tendon substance becomes rough by the lying down of collagen fibres over time giving rise to crepitus. Passive movement restricted because of fibrous thickening and shortening of the tendon.

Complaint of pain in activities and more in the night. Finds difficulty to lie on affected side shoulder. Resisted isometric contraction of supraspinatus is painful and weak, and passive stretching is restricted and painful.

**Stage-III** is marked by partial tear or complete tear of rotator cuff and usually is seen in patients over 40 years of age. Attrition of the degenerated tendon over time due to continued overhead activities finally may results into rupture. Rupture is characterised by loss of active movement, while passive movement is present. During abduction there is loss of gleno humeral rhythm; unopposed deltoid action produces more of elevation than abduction. Wasting of supraspinatus, Infraspinatus present and Drop arm test positive.

Later Neer divided impingement into outlet and non-outlet lesions. Outlet impingement occurs when the coracoacromial arch encroaches on the supraspinatus outlet and non-outlet occurs secondarily to thickening or hypertrophy of the bursa or the rotator cuff tendons.

**Clinical features:**

Patient complaints of insidious onset of pain over the lateral brachial region (C5, C6). Sharp pain experienced during overhead activities

**Inspection:**

Atrophy of Supraspinatus and Infraspinatus muscles

**Movements:**

Active Abduction → Painful arc present during abduction and elevation.

Passive abduction elevation → Painful arc may be present.

Passive internal Rotation → May be painful and restricted

RIC for supraspinatus, Infraspinatus or long head of biceps painful and weak

**Palpation**

Fibrous thickening and tenderness of suprahumeral structures may be present.

**Treatment.**

- (i) Prevent from further damage by avoid precipitating overhead activities.
- (ii) To resolve inflammation and allow for healing.
- (iii) Prevent from recurrence
- (iv) To return back to activities as early as possible.

**Ultrasound:** Micro massage effect resolves edema and heating effect increases circulation to promote healing.

**Cyriax's Deep transverse friction massage** rearrange proliferated collagen tissues in a functional way i.e. perpendicular to the direction of stress, one of the most effective manners to withstand the stress. It also disperses inflammatory exudates relieving pain and preventing adhesion. It prevents/ breaks the adhesion and increases the extensibility, restore mobility.

For supraspinatus, patient in half lying position with the hand behind the back (internal rotation) to move its tendon anteriorly out of the undersurface of acromion.

Therapist standing behind and back of the affected side places the index finger over middle finger over the exact spot and applies to and fro movements across the direction of tendon fibres with adequate pressure and sweep. As the initial pain and discomfort disappears gradually increase the pressure and again as the pain and discomfort disappears gradually increase the pressure further. The frequency of movement is 2/second. The treatment is applied for about 10 minute followed by active movements and passive stretching.

**Stretching and mobilization** to restore full range of pain free movements reduces pain and prevents recurrence.

To prevent recurrence progressive strengthening of rotator cuff to balance it with deltoid and balancing scapular rotators, trapezius and serratus anterior force couple is very important.

Townsend et al<sup>19</sup> examined glenohumoral muscles EMG analysis during a shoulder rehabilitation programme. Result showed that four exercises (Scaption with internal rotation, horizontal abduction in external rotation, flexion and press-up) were responsible for high level of EMG activity in all muscles. The leading exercise



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for infraspinatus and teres minor was horizontal abduction with external rotation.

Moseley et al<sup>18</sup> performed an EMG study of shoulder muscle in nine subjects during sixteen different exercises. He recommended the four core exercises programme for scapular muscles. They are Scaption, rowing, pushup with a plus and press-up.

Ekstrom et al<sup>101</sup> analyzed exercises for the trapezius and serratus anterior muscles by surface EMG and demonstrated that the shoulder horizontal extension with external rotation, shoulder shrug exercises, shoulder external rotation at 90° of humeral abduction, a combination of shoulder flexion, horizontal flexion and external rotation best activated the middle trapezius, upper trapezius, lower trapezius and serratus anterior respectively.



Hintermeister et al performed an EMG study of the shoulder muscles using elastic band of the resistance during seven exercises. They recommended that a shoulder shrug exercises for the upper trapezius muscle, seated rowing exercises for trapezius muscle, forward punch exercise for serratus anterior.

Pushup, dips, flies and bench press are not included in shoulder rehabilitation programme as these exercises may increase symptom of shoulder impingement syndrome with AC osteoarthritis.

Researchers have speculated that shorter resting length of pectoralis minor and tightness of posterior capsule are predisposing factors for impingement syndrome. Stretching programme may decrease impingement of shoulder. Stretching of anterior and posterior structures of shoulder joint is to be done.