

NECK AND ARM DISORDERS

Mats Hagberg

Terms and definitions

Characteristics of non-specific musculoskeletal pain in neck and shoulder

History

- Pain and stiffness gradually increase during work and are worst at end of working day and week
- Pain localised to cervical spine and angle between neck and shoulder
- Usually no radiation of pain
- Symptoms improved by heat and worsened by cold draughts

Signs

- Tenderness over neck and shoulder muscles
- Reduced range of active movement of cervical spine (normal passive movement)
- No neurological deficits

Differential diagnosis

- Thoracic outlet syndrome and other nerve entrapments
- Systemic diseases

Over recent years the use of terms such as repetitive strain injury (RSI) and cumulative trauma disorder have been strongly criticised. Sometimes the terms have even been used synonymously with disease terms such as carpal tunnel syndrome (compression of the median nerve at the wrist) and de Quervain's disease (inflammation of the tendons to the long thumb abductor and the short thumb extensor at the wrist). Neither carpal tunnel syndrome nor de Quervain's disease is necessarily related to repetitive strain or cumulative trauma.

Use of these terms to describe work related musculoskeletal disorders has been criticised because they suggest a pathological mechanism that is usually not proved. A work related musculoskeletal disorder may be caused by a single strain or trauma, not necessarily a repetitive or cumulative one. Furthermore, both psychological and social factors play an important role in the genesis and perpetuation of work related musculoskeletal disorders.

The World Health Organisation considers the cause of work related musculoskeletal diseases to be multifactorial. The work environment and the work performed are important but are not the only factors to be considered. The preferred term for conditions that may be subjectively or objectively influenced or caused by work is work related musculoskeletal disorder. This umbrella term neither defines the pathological mechanism nor the diagnostic criteria.

Specific risk factors

Risk factors for work related neck and arm disorders

- Posture
- Repetitive motion
- Handling loads
- Psychological and social factors
- Task invariability
- Individual susceptibility

Certain occupations are associated with a high risk for neck and arm pain. Some risk factors can be identified, but the interaction between different risk factors is not understood and there is not enough data yet to set accurate exposure limits for disease effects.

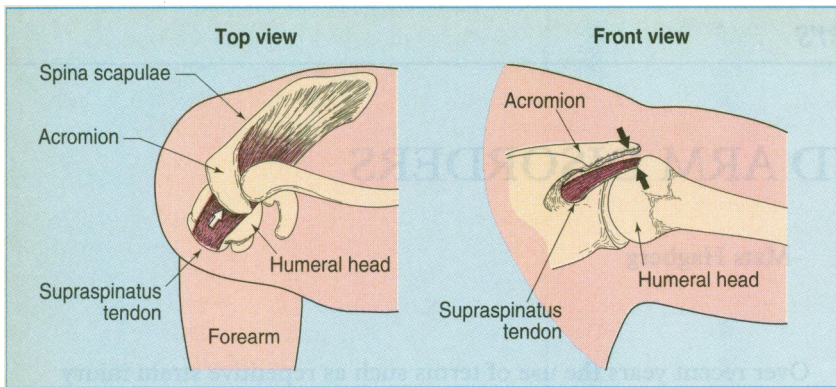
It is important to recognise that personal characteristics and other environmental and sociocultural factors usually play a role in these disorders. A patient with neck pain may be exposed to an awkward posture at work but also to social stress at home—both factors contribute to sustained contraction of the trapezius muscle, inducing pain and stiffness. The cause of a work related disorder can sometimes be attributed to a specific exposure in a job, but there is often simultaneous exposure to several different factors. Individual factors must also be considered when assessing the history of a patient with a work related disorder and when redesigning a job before such a patient returns to work.



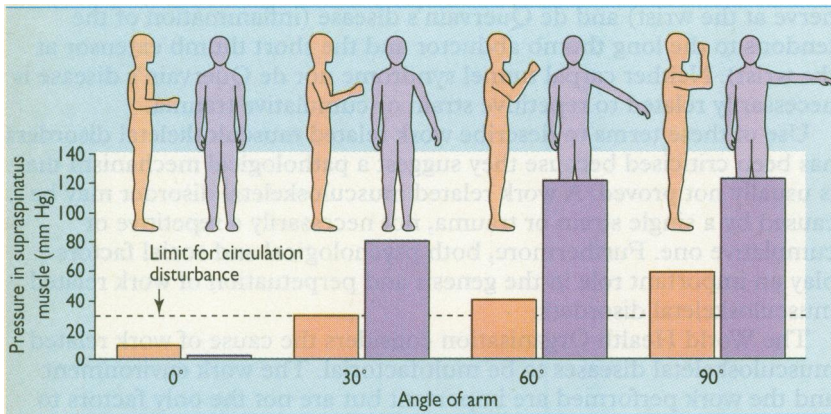
Truck assembly and welding—two jobs that often require working with the hands above shoulder height and that are associated with shoulder tendinitis.

Posture

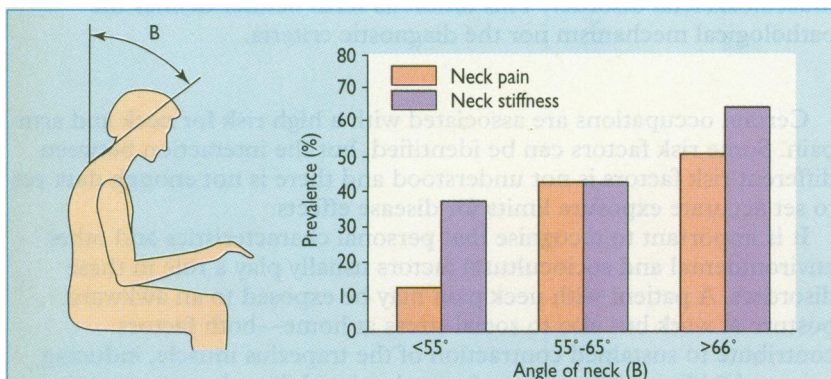
Working with the hands at or above shoulder level may be one determinant of rotator cuff tendinitis. Industrial workers exposed to tasks that require working over shoulder level include shipyard welders, car assemblers, and house painters. In one study the prevalence of rotator cuff tendinitis was 18% among shipyard welders compared with 2% among male office workers, corresponding to an odds ratio of 13.



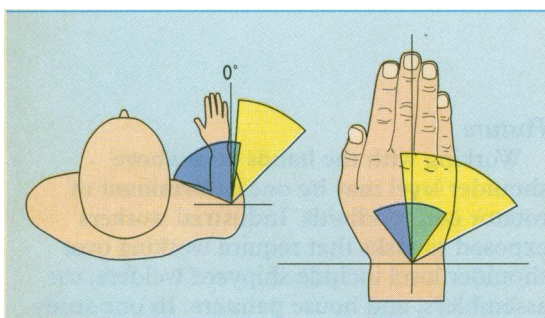
Impingement of supraspinatus tendon against surface of anterior part of acromion when arm is raised to shoulder height. Pressure and mechanical friction are centred on tendon (black arrows).



Intramuscular pressure in supraspinatus muscle at different angles of abduction and forward flexion.



Association between neck flexion and pain and stiffness in neck.



Outward rotation of shoulder and ulnar deviation of wrist found with use of computer mouse (yellow) and keyboard (blue).

Motion

Repetitive motions of the shoulder may constitute a risk for rotator cuff tendinitis. An experimental study showed that women performing repetitive forward flexions of the shoulder developed shoulder tendinitis. Clinical signs of tendinitis were present up to two weeks after the experiments. Repetitive motions by industrial assembly workers (truck making, meat packing, and circuit board assembly) have been associated with the development of shoulder tendinitis, lateral epicondylitis, and tendinitis at the wrist (de Quervain's disease).

Repetitive motion being a causal factor for tendinitis is consistent with the high risk of shoulder tendinitis among competitive swimmers and epicondylitis among tennis players.

Handling loads

Only a few studies have investigated the effect of handling loads on symptoms of the neck and arms. Handling heavy loads seems to be related to osteoarthritis and cervical spondylosis. A high risk of acromioclavicular osteoarthritis and shoulder tendinitis among rock drillers has been attributed to both handling loads and exposure to hand and arm vibration.

The pathogenesis of rotator cuff tendinitis is mainly impingement—the compression of the rotator cuff tendons when they are forced under the coracoacromial arch during elevation of the arm. The supraspinatus tendon is forced under the anterior edge of the acromion, causing both a compression that impairs blood circulation through the tendon and a mechanical friction to the tendon. Reduced blood flow to the tendons because of static muscle contraction may contribute to degeneration of the rotator cuff tendons.

Abduction and forward flexion of more than 30° may constitute a risk factor since the pressure within the supraspinatus muscle will be greater than 30 mm Hg, impairing blood flow. The vessels to the supraspinatus tendon run through the muscle, and so the pressure in the muscle can affect tendon vasculature.

Among players of musical instruments, unnatural and constrained postures are common. Pain in the neck and arm have been related to gripping an instrument and awkward posture. Pain in the left shoulder and arm in professional violinists can be due to static holding of the violin in the left hand.

Neck flexion while working at a visual display terminal may be associated with non-specific neck and shoulder symptoms. An exposure-response relation has been found for neck pain and angle of neck flexion among keyboard operators—neck pain was more prevalent among operators who flexed their necks more acutely. Incorrect glasses or need for glasses when working at a visual display terminal may result in neck and shoulder pain.

The development of non-keyboard input devices, such as the computer mouse, has resulted in new postures that may cause a combination of symptoms of the wrist and shoulder. Work tasks of long duration with flexed and, to some extent, extended wrists have been reported as risk factors for carpal tunnel syndrome.

Work related musculoskeletal disorders found in blue collar and white collar workers

	Assembly line worker	Keyboard operator
Shoulder pain	Usually shoulder tendinitis due to working with hands above shoulder height	Usually myofascial pain, which may be caused by task invariability leading to static tension of trapezius muscle
Hand and wrist pain	Repetitive power grips may cause repetitive strain of extensor tendons and tendinitis Carpal tunnel syndrome may also be related to repetitive power grips	Intensive keying may cause repetitive strain of extensor tendons and tendinitis Carpal tunnel syndrome may also be related to intensive keying

Psychological and social factors

Psychological and social factors are generally more strongly associated with back pain than shoulder pain. Furthermore, the association is stronger for non-specific pain than for pain with a specific diagnosis. This means that a diagnosis of general cervicobrachial pain may be more strongly related to psychological and social factors than carpal tunnel syndrome or shoulder tendinitis. Highly demanding work and poor work content (that is, repetitive tasks with short cycles) have been identified as risk factors for neck and shoulder pain. Psychological factors and personality type may be determinants of muscle tension and the development of myofascial pain.

Piece work is associated with neck and arm disorders when compared with work paid by the hour. This effect may be due to an increased work pace in addition to high psychological demand and low control in the work situation. Management style, in terms of social support to employees, is claimed to be associated with reporting of neck and shoulder symptoms. Social support from management obviously affects turnover of workers and sick leave.

Task invariability

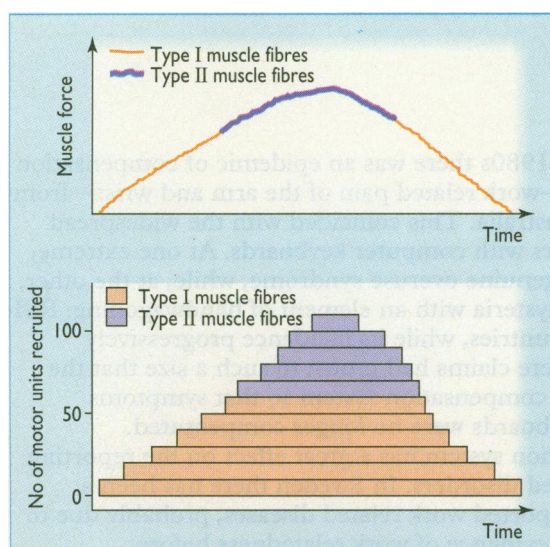
It used to be argued that to prevent work related musculoskeletal disorders it was necessary to minimise the load that workers were exposed to. This concept has led to the creation of jobs with low external load, but some of these are still not healthy. Poor work content usually leads to a job with invariable tasks, resulting in constrained postures and a low static load for the neck and arms. Ergonomists now try to design jobs that are not only physically variable but are psychologically variable and stimulating.

The health problems caused by task invariability may be due to prolonged static contraction of the trapezius muscle during work or daily activity resulting in an overload of type I muscle fibres, which might explain neck myalgia. At a low level of muscle contraction, the low threshold motor units (type I fibres) are used. A low static contraction during work may result in a recruitment pattern in which only the type I muscle fibres are used, causing selective fatigue of motor units and damage to the type I fibres. Biopsies of the trapezius muscle from patients with work related trapezius myalgia show enlarged type I fibres and a reduced ratio of area of type I fibres to capillary area.

Individual susceptibility

Individuals may have increased vulnerability to injury because of disease, genetic factors, or lack of fitness. This individual susceptibility may result in a lower than normal threshold for a given exposure to cause a work related musculoskeletal disorder. Furthermore, exposure may trigger symptoms early and at an unusual location because of local strain in a person with a preclinical systemic disease. For example, a worker exposed to repetitive flexion in the shoulder developed tendinitis one year before developing rheumatoid arthritis. An electrician exposed to repetitive power grips and vibration developed symptoms and signs of carpal tunnel syndrome—at surgery, these were found to be due to amyloidosis.

For work related musculoskeletal disorders, individual factors usually have a low magnitude of risk compared with relevant ergonomic factors.



Differential recruitment of muscle fibres with different levels of contraction. At low level static contraction, only type I muscle fibres may be recruited, leading to their selective fatigue and damage.

Individual susceptibility to musculoskeletal disorders

Age

- For most musculoskeletal disorders, risk increases with age

Sex

- Among both the general population and industrial workers, women have a higher incidence of carpal tunnel syndrome and muscular pain in the neck and shoulder than men
- Whether this is due to genetic factors or to different exposures at work and at home is not clear

Anatomical differences or malformations

- A rough surface and sharp edge of the intertubercular sulcus on the humeral head increase wear on the tendon of the long head of biceps muscle, which may make person more prone to biceps tendinitis
- A cervical rib is a common cause of neurogenic thoracic outlet syndrome: a repetitive task may be the occupational exposure that triggers clinical disease
- Width of carpal tunnel has been proposed as a risk factor for carpal tunnel syndrome, but there is no consensus

Prevention and management

Management of work related neck and arm disorders

Clinical management

- Non-steroidal anti-inflammatory drugs can reduce pain and inflammation
- Acupuncture can be used to reduce pain
- Corticosteroids—A single subacromial injection of corticosteroid mixed with local anaesthetic may cure a shoulder tendinitis. For tennis elbow and carpal tunnel syndrome, corticosteroids should be used by specialists only
- Heparin (15000 IU/day in a single intravenous dose) given for three to four days is effective treatment for acute crepitating peritendinitis
- Surgery—Surgical division of the carpal ligament is the first choice of treatment for carpal tunnel syndrome. For chronic severe shoulder tendinitis, surgical removal of the lateral part of the acromion may relieve pain at night
- Splints—Whether splints should be used to treat early hand and wrist tendinitis and carpal tunnel syndrome is still debatable

Modifications to working environment

- Job analysis—To assess work relatedness of a patient's symptoms it is necessary to evaluate posture, motion, handling of loads, psychological and social factors, and task invariability
- Job redesign—Job enlargement to reduce duration and frequency of stressful postures and load handling. Job enrichment to reduce poor work content and task invariability. Introduce new layout of workplace and technical aids
- Technique training—Ergonomists and supervisors can improve working technique to reduce stressors of postures, motion, and load handling
- Rests and breaks should be organised to allow recovery

The overall objective of management is to get a healthy patient and an early return to work by medical means and by modifying the patient's working environment.

Clinical treatment should be targeted towards relieving any pain and inflammation and restoring a patient's range of movement. Physical conditioning by strength and aerobic training may reduce pain and increase a patient's work capacity, while psychological conditioning by stress management techniques may increase a person's ability to cope with work related stressors.

Patients should be encouraged to remain at work. Sick leave may develop into chronic disability. Try to find work tasks that the patient can perform at least on a part time basis. Otherwise make sure the patient has contact with the workplace at least once a week. Time off work is a powerful predictor of disability pension.

“RSI”

Principles of managing hand and arm pain in keyboard operators

- Exclude clear pathological causes such as carpal tunnel syndrome
- Reassure patient that the condition is curable
- Keep patient at work if possible but away from keyboard work if necessary
- Monitor patient's progress with regular follow up
- When symptoms have subsided advise gradual reintroduction of precipitating factors
- Explore psychological profile, including attitudes to work and support from management and colleagues
- Liaise with patient's workplace, if possible with an occupational physician or nurse
- Ensure that workstation ergonomics have been evaluated and are satisfactory and that patient has been taught to use the equipment properly and has the right glasses
- Inquire about variation of work tasks, work intensity, and whether there are rules or opportunities for breaks from keyboard work or job rotation
- Hospital admission is rarely needed, and specialised physiotherapy is of dubious benefit
- Those few patients who do not respond to this multidisciplinary management may eventually have to be trained to use voice activated word processors, etc

In the middle and late 1980s there was an epidemic of compensation claims for so called RSI—work related pain of the arm and wrist—from keyboard operators in Australia. This coincided with the widespread replacement of typewriters with computer keyboards. At one extreme, this was thought to be a genuine overuse syndrome, while, at the other, it was regarded as mass hysteria with an element of bandwagoning. RSI also appeared in other countries, while its incidence progressively declined in Australia, where claims had grown to such a size that the government changed the compensation system so that symptoms associated with using keyboards were no longer compensated.

A country's compensation system has a great effect on the reporting and control of work related disorders. In Sweden there has been a substantial decrease in reported work related diseases, probably due to an increased demand for evidence of work relatedness before compensation is approved. This conjecture is supported by statistics showing that rates of reported work related musculoskeletal symptoms in national surveys are constant. A generous compensation system can lead to patients becoming medicalised and lacking the motivation to attempt rehabilitation. However, a compensation system that facilitates reporting of work related disorders allows early identification of hazards that may constitute a serious risk to a workforce.

The existence of RSI as a clinical entity has been challenged medically and legally. Many sufferers have won compensation, but very few have secured damages by means of civil litigation—almost all claims are settled out of court. The diagnosis of RSI (a completely unsatisfactory term as explained earlier) is usually one of exclusion, there being, by definition, no physical signs. Whatever the true nature of the condition, almost every doctor will see patients who relate their pain syndrome to keyboard work, and management is seldom easy or straightforward. Ideally, it should be multidisciplinary.

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The ABC of Work Related Disorders is edited by David Snashall, clinical director of Occupational Health Services, Guy's and St Thomas's Hospitals NHS Trust, London.

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