

PRESS OPERATOR AND REPETITIVE STRAIN INJURY

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Abstract

Repetition Strain Injury (RSI) is usually caused or aggravated by poor work processes and unsuitable working conditions - that involve repetitive or forceful movements or the maintenance of constrained or awkward postures. The condition is characterized by discomfort and persistent pain. There are three essential steps to eliminate or control hazards in workplace. Case and Demographic Characteristics for Work-related Injuries and Illnesses Involving Days Away From Work, 2002. U.S" was examined. Causes of press operators' RSI were carpal tunnel syndrome(CTS), tendonitis, low back pain, and occupational stress. Recommendations for improvement of productivity are redesign of working conditions, exercise, prevent of RSI and avoiding stress.

Keyword : RSI, press operation, risk assessment, stress, exercise

I. INTRODUCTION

RSI is a collective term for a range of conditions characterized by discomfort or persistent pain in muscles, tendons and other soft tissues in the back, neck, shoulder, elbows, wrists, hands or fingers. Every time of movement, the connective tissue has to contract and lengthen. Through injury and repetitive movement, the connective tissue becomes stressed, and pain, numbness, and swelling can occur, eventually leading to loss of movement. Some of the more familiar RSI types are tennis elbow, carpal tunnel syndrome, tendonitis, and writer's cramp.

RSI injuries have been recorded since the 1700s but have become more common in modern times with the change in mechanization and lifestyle. Surgery and other medical procedures can improve the condition, but body maintenance and a holistic approach to one's lifestyle it the best long term solution for prevention of carpal tunnel and other RSI injuries.

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The RSI affects the press operator by manual material handling(lifting, carrying, holding, pushing & pulling). The purpose of this study is to reduce the RSI for press operator by risk analysis.

II. RISK ANALYSIS

There are three essential steps to eliminate or control hazards in workplace.

2.1 Hazard Identification

2.1.1 History of injury and illness

Examine the types of injuries and illnesses that are occurring in the workplace by asking employees and reading through first aid reports and previous compensation claims.

2.1.2 Job Safety Checks

Observing a job from start to finish and recording its steps gives opportunity to assess each step for potential hazards that may have been overlooked in the past.

2.1.3 Employee consultation

Ask employees, health and safety representatives/committee members.

2.1.4 Safety audits

This audit would usually be conducted by external safety consultants and would result in a written report with recommendations for improvement. Insurance companies can also conduct safety audits prior to renewal of insurance policies.

2.2 Risk Assessment

Once hazards have been identified, assess the risk. This is the likelihood of an injury or illness occurring from exposure to the hazard. When assessing risk, severity, frequency, intensity of the exposure should be taken into account.

Severity can be classified as : Minor injury with no time off work, An injury/illness resulting in time off work, An injury/illness causing a permanent disability or loss of body part or bodily function, and An injury /illness that could cause death.

The overall purpose of the assessment is to determine priorities in risk control.

2.3 Risk Control

Once the hazard has been assessed, control options for eliminating or reducing the risk of exposure to the hazard must be considered. Health and safety legislation generally requires the following hierarchy of control options to be used particularly in relation to plant, noise, manual handling and hazardous substances. These controls include;

- (1) Elimination : Modifying the design of the workplace.
- (2) Design or substitution : Use of less hazardous chemical materials.
- (3) Engineering controls : Enclose, isolate, mechanical aids, machine guards.
- (4) Administration : Work procedure and work organization.
- (5) Training
- (6) Personal protective equipment

III. RSI & PRESS OPERATION

3.1 RSI

RSI is usually caused or aggravated by poor work processes and unsuitable working conditions - that involve repetitive or forceful movements or the maintenance of constrained or awkward postures. The condition is characterized by discomfort and persistent pain.

Symptoms of RSI often include swelling, numbness, restricted movement and weakness in or around muscles and tendons of the back, neck, shoulders, elbows, wrists, hands or fingers. It may become difficult to hold objects or tools in the hands, affecting ability to function at work and at home. The pain may be slight. If action is taken immediately, no damage is likely to occur. If no action is taken, the condition may get worse. Pain may continue while doing other movements or even while not using the injured part of the body at all. Pain generally stops with rest, but prolonged periods of rest may be necessary to reduce severe pain. If nothing is done to redesign the work to eliminate or reduce the risk of injury, then permanent damage may result.

RSI may affect workers in any occupation, particularly those doing tasks which involve repetitive or forceful movement of both arms and maintenance of constrained or awkward postures.

Following works are particularly at risk.

- (1) Process work (assembly line, sorting, packing and press operation);
- (2) Piece work (clothing machinists at home or in a factory);
- (3) Office work (keyboard, typing, clerical work);
- (4) Mail sorting;
- (5) Kitchen work;
- (6) Cleaning;
- (7) Hairdressers;
- (8) Musicians;
- (9) Construction workers (bricklayers, carpenters, plumbers and tilers).

3.2 Press Operation

RSI may affect workers in any occupation depending on the type of work that is being performed and the conditions under which the work is taking place. Work requiring repetitive hand movements has been most commonly associated with RSI, but activities like constant lifting, bending, reaching or twisting or exerting pressure can also cause overuse injuries.

It is particularly a problem in process work (assembly line, sorting, packing and press operation), piece work (clothing machinists at home or in a factory), office work (keyboard, typing, clerical work), mail sorting, kitchen work, cleaning, hairdressing and among musicians. Construction workers, such as bricklayers, carpenters, plumbers and tilers are also at risk.

[Table 1] shows nature of injury and press operation analysis. Following operation affects press operators' musculoskeletal system.

IV. ANALYSIS OF INJURY

4.1 Review of Statistics

"Case and Demographic Characteristics for Work-related Injuries and Illnesses Involving Days Away From Work, 2002. U.S" was examined. < Table 2 > shows

< Table 1> Nature of Injury and Press Operation Analysis

Nature of Injury	Operation Analysis
RSI	1) pulling down a press 2) operating a press 3) pushing steel rings into a machine 4) pulling a press down 5) pushing a press with foot 6) loading industrial washing machine, folding cloths 7) cutting plastic off electrical switches 8) removing plastic dividers from a press
blindness	operating a metal turning lathe
tendonitis	lifting heavy steel sheets
fracture	fell while climbing over launder (a channel)
strain	1) repetitive operation of press 2) removing casts from presses 3) placing and removing components from die area 4) lifting/handling bundles steel wire, operate press 5) persisted with heavy lifting / pulling while injured 6) slipped on oily mesh surface 7) repetitive operation of grinding disk machine 8) Lifting heavy metal parts
hernia	lifting formed steel section - ascending stairs
mmh	lifting bundles of clothes, hanging linen, pressing
crush	press operation
ulcers, stomach & psychological	operating a press; alleged oppression

number of nonfatal occupational injuries & illness involving days away from work by punching & pressing and selected of body parts. The injuries of press operators' upper extremities took account for 46.8%(644) out of total injuries(1377) by punching & pressing. The second largest portion was on trunk(27.5%).

[Table 3] shows number of nonfatal occupational injuries & illness involving days away from work by punching & stamping and selected natures of injury or illness. The sprain took account for 25.2%(586) and carpal tunnel syndrome took account for 3.78%(88) out of total injuries(2326) by punching & stamping.

< Table 2 > Number of Nonfatal Occupational Injuries & Illness Involving Days away from Work by Punching & Pressing and Selected of Body Parts

Punching & Pressing	total	head		neck	trunk			upper extremities			lower extremities			
		total	eyes		total	back	shoulder	total	finger	hand	wrist	total	knee	foot, toe
	1377	82	65	-	378	173	87	644	336	145	77	177	48	60

< Table 3 > Number of Nonfatal Occupational Injuries & Illness Involving days away from Work by Punching & Stamping and Selected Natures of Injury or Illness

Nature of Injury or Illness							
total	sprains	fractures	cuts	bruises	heat	chemical burns	amputations
2326	586	191	398	201	19	-	81
Nature of Injury or Illness							
carpal tunnel syndrome	tendonitis	multiple traumatic injuries & disorders			back pain & pain, except back		all other natures
		total	with fractures, burns, & other injuries	with sprains & bruises	total	back pain, hurt back only	
88	-	70	-	17	94	-	552

4.2 Causes of Press Operators' RSI

4.2.1 Carpal tunnel syndrome(CTS)

CTS is a repetitive strain injury. A major nerve, the median nerve, passes through a narrow tunnel at the wrist. The tunnel is called the carpal tunnel and is formed from carpal bones and a thick ligament. The median nerve supplies sensation to the thumb, index finger, middle finger, half of the ring finger and some thumb muscles. The tendons that pass through the carpal tunnel allow the

forearm muscles to move the fingers. When the ligament in the carpal tunnel thickens, for the reasons indicated above, it puts pressure on the nerve. This pressure causes numbness and potentially pain in the first three to four fingers of the hand. The most common reasons for carpal tunnel syndrome is the thickening of the ligament however other reasons may include swelling of the tissues and the bones surrounding the carpal tunnel such as rheumatoid arthritis. Fractures can also affect the nerves causing CTS. Diseases such as diabetes, which may damage the median nerve, may also cause CTS. Pregnancy, thyroid disease, use of oral contraceptives, diabetes, rheumatoid arthritis, and Lyme disease all involve fluid retention and can contribute to CTS.

4.2.2 Tendonitis

Tendonitis inflames tendon commonly associated with repeated tension, motion, bending or vibration. Tendon thickens and develops irregular surface with tearing of tendon fibers. Tendonitis contributes assembly work, packaging, use of pliers, punch press operator, and computer operation.

4.2.3 Low back pain

Material handling(lifting, carrying, holding, pushing & pulling) works might affect press operators' RSI. Strain injuries of the muscles and ligaments through overexertion or continuous overuse. Injuries can be sudden or occur over a long period of time.

Back, neck injuries and hernias are serious injuries. They can be debilitating and can effect an individuals general lifestyle as well as their working life through restricted movement and pain. These injuries take a longer time to heal and often require time off work. Unplanned time off work can cause disruption to your business' productivity. Worker's compensation claims regarding these injuries are costly.

4.2.4 Occupational stress

Occupational stress results from negative harmful stress or distress. The more obvious forms of stress are severe stress reactions from exposure to trauma and/or violence at work. This is often referred to as critical incident stress. Occupations that see and work with trauma include the paramedical and health care professionals, community care workers, police and prison officers.

More subtle forms of stress may arise as a result of:

- (1) Unrealistic workloads and deadlines;
- (2) Shiftwork;
- (3) Long work hours;

- (4) Job insecurity;
- (5) Lack of understanding of the job;
- (6) Lack of control over workload;
- (7) Poor communications between management and employees;
- (8) Hazardous working conditions;
- (9) Working with persons who are sick, injured or dying;
- (10) Handling complaints, dealing with abusive customers;
- (11) Poor job placement;
- (12) Lack of job satisfaction;
- (13) Repetitive, unstimulating tasks.

Most of the above contributing factors are easily rectifiable once the signs and symptoms have been identified.

V. RECOMMENDATIONS FOR IMPROVEMENT OF PRODUCTIVITY

5.1 Redesign of Working Conditions

Below is a list of suggested practical solutions which can help to reduce the risk of occupational overuse injuries.

5.1.1 Changes to the way work is organized

- (1) reorganize the work to mix repetitive and non-repetitive activities
- (2) frequent, short rest breaks should be introduced if the job cannot be varied or rotated. - simple and gentle exercises performed at the workstation can reduce muscle tension
- (3) work rates can be reviewed to ensure they are realistic and within physical and psychological capabilities

5.1.2 Changes to the workplace environment

- (1) ergonomically designed workplace of press which can be adjusted to suit employees of different sizes
- (2) the work area may be able to be rearranged
- (3) controls can be easily reached without stretching or twisting
- (4) hand tools for repetitive tasks should be a comfortable size, shape and weight, be well-balanced with a comfortable grip and need no more than reasonable force to operate;

- (5) if the job needs precise movements, make sure the task is done slightly above elbow level. Arrange work so that elbows remain in relaxed positions close to the body, and so that your shoulders are relaxed, avoiding strained muscles in the shoulders and upper arms. If the job needs a lot of muscle strength, make sure the task is done slightly below elbow level.

5.2 Exercise

Exercises relieve and prevent repetitive stress injuries.

(1) Neck message

Massage gently and firmly along both sides of the neck using a circular motion with finger pads. Then place hands at the base of the skull, and gently push up with fingers.

(2) Forward arm extension

With the opposite hand, palm upward, support elbow with the palm of hand. Then gently but firmly flick forearm from the elbow outwards. Do this exercise on both arms.

(3) Lateral arm extension

With arm extended, palm down, support elbow joint with opposite hand. Bend forearm to a right angle in front of body. Then gently but firmly flick forearm outward as supporting firmly and stabilizing elbow joint. Do not go past the shoulder line.

(4) Wrist press

Place left thumb on top on right's wrist, pointing toward the elbow, and curl fingers around the outer part of the right hand on the little finger side. Move the supported hand, flexing and extending it up and down as press left thumb gently but firmly into the wrist. Move thumb slowly across the wrist, pressing into the tendons of wrist as continue to flex and extend it

(5) Wrist pull

Grasp one hand with other hand. Gently pull the hand away from the wrist and hold for five seconds. Repeat on the other hand.

(6) Wrist squeeze

Use the opposite hand to gently but firmly squeeze wrist bones together on one hand. Repeat on the other hand.

(7) Finger pull

Gently grasp each finger at the base of the finger joint closest to palm and slowly pull. Pull each finger once then repeat on the other hand.

(8) Thumbs

Extend arm straight on a table. Turn wrist and tuck thumb under hand. Keeping thumb tucked under, and with the shoulders level, begin to draw the back of wrist towards the center of body.

(9) Upper back stretch

Clasp hands together and inhale. Exhale as extending arms out at chest level, stretching forward. Drop head, sink chest inward, and round shoulders forward. Hold for five seconds, the exhale as release hands and draw shoulders back and down.

(10) Shoulder, chest, and elbow stretch

Clasp hands and interlace fingers together behind back, with palms toward the back, and inhale. Exhale as straighten arms and elbows, and gently stretch arms backwards, away from back. Stretch slowly, and hold the stretch for five seconds.

An alternative to this exercise is to clasp hands behind back at the hip level. With shoulders down and relaxed, pull clasped hands to the left. Tilt head to the left, bringing left ear and left shoulder closer.

(11) Follow the above exercises with a series of muscle massages in the arms, hands, and elbows.

(12) Tendon stretch for computer users

Sit comfortably in an armless chair with feet planted on the floor. Extend right arm out horizontally with palm facing the floor. Bend wrist down so fingertips are pointed toward the floor. With other hand, gently press down turned right hand toward body. Press until feel a pull. Hold for about ten seconds. Repeat step two times. Then switch and press back the left hand.

5.3 Prevent of RSI

5.3.1 Carpal tunnel syndrome(CTS)

Several precautions can be taken to avoid carpal tunnel syndrome.

- (1) Avoid repetitive hand motions with a bent wrist. Keep the wrist straight.
- (2) Take frequent breaks (five minutes each hour) from repetitive hand motions. Stretch your fingers and thumb and change your grip often.
- (3) Maintain good posture. Avoid rounding your shoulders or posture.

5.3.2 Manual handling injuries

- (1) Avoiding risks in the first place by safe design of plant, processes, equipment and products

- (2) The identification, assessment and control of risks arising from manual handling activities (refer to Conducting a Risk Assessment for advice on how to do this).
- (3) Conducting and documenting risk assessment in consultation with employees.
- (4) Controlling risk by redesign and providing mechanical lifting aids.
- (5) Providing training for employees regarding manual handling generally and job specific requirements.

5.4 Avoiding stress

Reactions to stress may involve both physical and psychological symptoms and are very individual responses. Stress may also be related to issues outside the workplace such as personal problems, alcohol, or substance abuse. It may not be obvious when someone is experiencing stress.

Stressed workplaces usually have low employee morale, absenteeism and a high frequency of accidents. Do not forget that you too may also experience stress at some time.

- (1) Get plenty of sleep and rest.
- (2) Keep physically fit.
- (3) Eat well and regularly.
- (4) Keep alcohol, drugs and caffeine to a minimum.
- (5) Consider attending stress management, time management, conflict and resolution courses.
- (6) See doctor/counsellor for advice.

VI. CONCLUSIONS

Occupational overuse injuries can be serious and debilitating. Thus, employees might suffer from these injuries often need time off work. Unplanned time off work can cause disruption to business' productivity. Workers' compensation claims for these injuries can be costly.

Therefore, to prevent occupational overuse injuries, generally followings are needed. (1) Avoiding risks in the first place by safe design of plant, work processes, equipment and products. (2) The identification, assessment and control of risks arising from occupational overuse (refer to Conducting a Risk Assessment for advice on how to do this). (3) Providing training and information to employees on correct work methods and postures and the correct use of tools, machinery and other equipment.

Causes of press operators' RSI were carpal tunnel syndrome(CTS), tendonitis, low back pain, and occupational stress. Recommendations for improvement of productivity are redesign of working conditions, exercise, prevent of RSI and avoiding stress.

VII. REFERENCES

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저 자 소 개

김 대 식 : 현 안산공과대학 공업경영학과 교수

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