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Case Report Carpal Tunnel Syndrome Operator Production Footwear

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ABSTRACT

Abstract: Carpal tunnel syndrome (CTS) is a neuropathy disorder commonly observed in workers who engage in repetitive and high-intensity hand or wrist movements, such as cutting, sewing, gluing, or pressing. Prolonged exposure to these activities can increase pressure on the median nerve, leading to symptoms of pain, tingling, numbness, and hand weakness.

Case Report: A 31-year-old woman worked as a production operator in the stock fitting department of a footwear factory for 11 years, presented with tingling, numbness, and weakness extending from the wrist area to the fingers of both hands, especially affecting the thumb, index finger, and middle finger. These symptoms had progressively worsened over the past three months. Her job involved a rotational workflow requiring repetitive hand movements combined with physical exertion. Due to increasing discomfort and functional impairment, she had been unable to work for the past two weeks. Although right-handed, she frequently used her left hand for work-related tasks.

Discussion: Occupational CTS in footwear factory workers is commonly associated with prolonged repetitive hand and wrist movements. Clinical examination revealed tingling, numbness, and weakness in the affected areas, particularly in the first three digits. Tinel's and Phalen's tests were positive, supporting the diagnosis of CTS. Occupational CTS was establish using the seven-steps occupational diagnosis method outlined by the Indonesian Association of Occupational Medicine Specialists (PERDOKI). This approach considers clinical assessment, occupational exposure history, work-related and non-work-related risk factors.

Conclusion: Occupational CTS can be effectively diagnosed using a structured occupational diagnostic approach. Preventive measures, including administrative controls such as task rotation, ergonomic workplace adjustments, and worker education on proper hand positioning, are essential to mitigate the risk of occupational CTS among workers engaged in repetitive manual tasks.

Keywords: Carpal Tunnel Syndrome (CTS), Repetitive Strain Injury (RSI), Median Nerve Compression, Ergonomic Interventions, Occupational diagnosis,

INTRODUCTION

Carpal tunnel syndrome (CTS) occurs when the median nerve is compressed as it passes through the carpal tunnel. The primary contributing factor to CTS is increased pressure within the carpal tunnel. Early symptoms typically include pain, numbness, and tingling in the first three digits of the hand and the lateral half of the fourth digit. Symptom severity can vary, with pain often localized at the wrist and potentially radiating throughout the hand, forearm, or even beyond the elbow.[1][2]As the condition progresses affected individuals may experience a significant decline in grip strength, accompanied by hand weakness and restricted movement.[2].

The prevalence of CTS is estimated to be approximately 5% in the general population.[3] Risk factors for CTS can be categorized into modifiable and non-modifiable risk factors. Modifiable risk factors include occupations that require repetitive hand and wrist movements, such as factory work, construction, and office tasks; repetitive movements, including keyboard typing or machine operation; poor ergonomic postures, such as sustained wrist flexion or deviation; obesity and smoking. Non-modifiable risk factors include age, gender, genetic predisposition, and a history of wrist trauma. [4]

Various occupational groups exposed to these risk factors face an increased risk of developing carpal tunnel syndrome (CTS). The prevalence of work-related CTS varies widely across occupational studies, ranging from 1% to 62%. [4][5][6][7][8][9]. However, research on CTS among workers in Indonesia remains limited. A study conducted in Karanganyar, Central Java, reported a 62% prevalence of CTS among female food packaging workers.[9] Similarly, a survey in Jakarta's garment industry revealed a high prevalence of 20.3% among workers. [10]

The global footwear manufacturing industry has experienced substantial growth, with production reaching 22.1 billion pairs of shoes in 2018. China, India, and Vietnam dominate global production, while China, India, and the United States are the largest consumer markets. Additionally, China, Vietnam, and Indonesia are among the leading footwear exporters. [11].

The footwear industry demands intensive manual labor across multiple occupational categories, demanding expertise in handling complex objects and machinery. Footwear production consists of several critical stages—preparation, cutting, sewing, assembly, and finishing—carried out manually, semi-automatically, or automatically. The diversity of these processes introduces significant occupational risks, contributing to both physical and psychological health issues. Due to the interdependent nature of manual processes, disruptions in one area can substantially impact overall productivity.

Musculoskeletal disorders, particularly neuromusculoskeletal injuries, are prevalent in this sector,

affecting muscles, tendons, and joints. As a result, these conditions represent a major occupational health concern. This underscores the urgent need for a comprehensive redesign of work processes to enhance efficiency and worker well-being.[11]

Occupational factors, including exposure to vibrating tools and repetitive tasks, greatly elevate the risk of developing carpal tunnel syndrome (CTS). Research indicates that individuals in manual occupations experience significantly longer sick leaves following carpal tunnel release surgery compared to their non-manual counterparts. The prognosis post-surgery is generally favorable, with most non-manual workers returning to work within two weeks, while manual laborers typically require 6-8 weeks for recovery. However, CTS can result in long-term health and financial consequences.

In Denmark, general practitioners and trade unions actively refer patients suspected of work-related CTS to occupational medicine departments, where medical professionals conduct comprehensive assessments to evaluate potential workplace causes. While these departments do not provide direct treatment, patients receive essential guidance on available evaluations and treatment options at hospitals.[12]

Indonesia as one of the largest exporters of footwear, operates its factories using manual, semi-manual, and automated production methods. Given the demanding nature of these processes, it is essential to investigate whether neuromusculoskeletal disorder such as CTS among footwear factory workers should be classified as occupational diseases. To aid in this determination, the Indonesian Occupational Medicine Association has established a structured framework comprising seven steps for diagnosing occupational diseases. Implementing this approach will significantly improve doctors' ability to make early diagnoses of work-related CTS and strengthen efforts to prevent occupational diseases effectively.

CASE PRESENTATION

A 31-year-old woman was referred by her neurologist to an occupational medicine clinic with a diagnosis of Carpal Tunnel Syndrome (CTS)due to concerns that her condition was work-related. The patient initially experienced tingling, numbness, and weakness extending from the wrist to the fingers in both hands, especially to the thumb, index, and middle finger. These symptoms worsened especially at night, often causing sleep disturbances. She also reported numbness in both hands upon waking. The patient denied any history of hypertension, heart disease, diabetes, trauma or accidents involving her hands. She was a non-smoker and engaged in regular exercise infrequently.

The patient first sought treatment for these symptoms three months prior. Since then, she has been under the care of a neurologist, attending monthly consultations and receiving painkillers at each visit. Additionally, she has been undergoing physiotherapy twice a week at the same hospital. Although her condition has shown some improvement following several months of physiotherapy, she continues to

experience difficulties with daily activities such as sweeping, mopping, cutting vegetables, washing dishes. Given her current condition, she feels unable to return to work.

The patient had been employed as a production operator in the stock fitting department of a footwear factory for 11 years. Her job responsibilities included operating a shoe press machine, dismantling rejected shoes, lifting goods, repairing shoes, washing shoes, and attaching the upper part of the shoe to the pylon. All the tasks involved repetitive movements and significant physical exertion. She worked as part of a team of 3-4 other workers, collectively responsible for producing 120 pairs of shoes per hour. At times, she had to compensate for absent colleagues by handling additional workloads. Due to workforce limitations, she had been working overtime for up to 10 hours per day over the past two years, sometimes extending into night shift, which rotated weekly. She worked six days a week, with half-day shifts on weekends

In response to her symptoms, the patient was transferred to a new work area in an attempt to find a suitable position. However, most available jobs carried similar ergonomic risks or required specialized skills that did not match her abilities. As a result, her symptoms did not improve significantly. Eventually, she began taking extended sick leave and had been absent from work for the past two weeks due to increasingly discomfort and difficulties in performing daily activities. Although she is not left-handed, she frequently uses her left hand for work-related tasks.

On physical examination, the blood pressure was normal and her body mass index (BMI) was 27.1 kg/m^2. Tinel's Sign, Phalen's Test, and Reverse Phalen's Test were all positive in both hands, especially on the left. Grip strength was reduced bilaterally, with more pronounced weakness in the left hand.

An occupational medicine assessment was warranted to establish a diagnosis of occupational disease. Coordination was carried out with the labor union and company management to ensure their willingness to report the case to BPJS Ketenagakerjaan if the conditions was deemed work-related. Using the seven-step assessment for diagnosing occupational disease, as outlined in the Regulation of the Minister of Health of the Republic of Indonesia Number 11 of 2022 concerning Occupational Disease Health Services, the patient was diagnosed with an occupational disease: Occupational Carpal Tunnel Syndrome (ICD-10 code: G56.0 & Y96).

DISCUSSION

Carpal tunnel syndrome (CTS) is a well-documented occupational disease, particularly in industries involving repetitive manual tasks. In this case, the patient's symptoms, physical examination findings, and workplace exposure history strongly support the diagnosis of occupational CTS. The seven-step occupational diagnosis method, as outlined by the Indonesian Association of Occupational Medicine Specialists (PERDOKI), provides a structured approach to confirming the work-related nature of CTS.

The patient's repetitive hand movements and prolonged physical exertion align with known risk factors for CTS in the footwear manufacturing industry, where high-repetition tasks are prevalent. Epidemiological studies have demonstrated an increased incidence of CTS among workers in similar industries, reinforcing the strong occupational link.

While individual factors such as obesity, metabolic disorders, or prior wrist injuries can contribute to CTS, this patient lacked such predispositions. Additionally, no significant non-occupational risk factors were identified, further strengthening the conclusion that the primary cause of CTS in this case was workplace exposure.

Given the long-term nature of repetitive exposure in this patient's employment history (11 years), the diagnosis of Occupational Carpal Tunnel Syndrome (ICD-10: G56.0 & Y97) was established. Preventive strategies, including ergonomic interventions, task rotation, and improved workplace policies, should be prioritized to reduce CTS incidence in similar occupational settings.

CONCLUSION

Based on the assessment of workplace hazard exposure, job description, and application of the seven-step occupational diagnosis method, it is concluded that this worker has Occupational Carpal Tunnel Syndrome (CTS). This case highlights the risk of CTS in the footwear industry, emphasizing the need for preventive measures to minimize ergonomic hazards.

To mitigate the risk of occupational CTS, workplaces should implement ergonomic controls, task rotation, and workplace modifications to reduce repetitive strain injuries. Additionally, the worker is encouraged to report this case to BPJS Ketenagakerjaan independently if company support is unavailable. Appropriate medical and occupational management is essential to prevent further disability and ensure long-term health and work sustainability.

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