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Review Article

Hand arm vibration syndrome in dentistry: A review

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ABSTRACT

Exposure to vibrating hand-held tools can cause a variety of vascular and neuromuscular symptoms collectively named Hand-Arm Vibration Syndrome (HAVS). The use of dental hand pieces exposes the dental personnel to high-frequency vibration. Dentists and Dental technicians have been shown to have a high frequency of finger-related and other upper limb symptoms and a high prevalence of osteoarthrosis in the distal interphalangeal joints. HAVS can be reversible, at least in the earlier stages, but resolution of symptoms is unusual in more severe cases, and continued use of vibrating tools in such cases is unwise. The Author concludes with a plea to health professionals to be ever vigilant and responsive to the HAVS problem or else it will proceed unabated into the next century.

Contents

1. Introduction

Exposure to vibrating hand-held tools can cause a variety of vascular and neuromuscular symptoms collectively named Hand-Arm Vibration Syndrome (HAVS). The clinical presentation of this syndrome includes paraesthesiae or tingling in digits, pain or tenderness in the wrist and hand, digital blanching, cold

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intolerance, weakness of the finger flexors or intrinsic muscles and discoloration and trophic skin lesions of the fingers.

The duration of exposure needed to produce HAVS cannot be readily defined. This is due not only to different individual susceptibilities to vibration, but also to the different physical characteristics of vibration exposure. There is a cumulative effect of vibration on both the vascular and sensorineural components of HAVS and these components appear to occur and progress independently of each other.[1]

2. Discussion

It is well known that exposure to prolonged (i.e. for several years) exposure to vibration is harmful, and can cause various types of hand dysfunctions. Most common are a loss of sensibility, blanching, and decreased grip force in the hands—that is, Hand-Arm Vibration Syndrome (HAVS).

Vibration injuries are also common in many other industries with vibration exposure, such as construction, cutting and sheet metal work, auto repair, welding and electrical work. The injuries often impact the working-age population (young or middle-aged men) and the consequences can be very serious. Damage to the nerves of the hand leads to reduced dexterity and impaired fine-motor skills ("clumsiness") and in some cases, severe pain and cramps.

Dental technicians regularly use different hand-held motor operated tools and therefore hand-transmitted vibration exposure is common in dental laboratories. Hand and finger dysfunctions and a high relative risk of getting a vibration injury have been reported among dental technicians.[2] Among dental technicians the relative risk of getting a vibration injury was reported 680 times greater.[3]

The vibration spectra of handpieces used in dental laboratories contain high frequency components,[4] but the effects of this "ultravibration" are not well known.[5]

According to the EC (European Community) Vibration Directive the daily exposure limit value standardised to an eight-hour reference period shall be 5 m per second squared, and the daily exposure action value standardised to an eight-hour period shall be 2.5 m per second squared, as defined in ISO standard 5349-1.[6,7]

2.1. Dental tools incriminated for HAVS-

- Hand pieces
- Hand held electrive drive unit which can be fitted with a range of tool heads for
  - Burnishing,
  - Milling or Grinding,
  - Ultrasonic scalers
- Vibration Tools

3. Classification

HAVS is classified according to severity in stages 1–3 using the Stockholm Workshop scales.

3.1. Stockholm (revised) hand-arm vibration syndrome classification[8]

The syndrome is separated into two major areas – vascular and sensorineural. The staging is made for each hand (Table 1).

4. Cause

The tendency to develop vibration injuries in the hands varies significantly between individuals; some get these symptoms after a few years of vibration exposure, while others can work for decades without problems.

When a vibration injury is fully developed, it is irreversible. The affected person will, in other words, not recover even if the vibration exposure ceases. At this point it cannot be cured by medical or surgical means. Therefore, it is extremely important to detect incipient vibration damage while prophylactic measures are still effective. For example, it might be possible to change tools or methods to prevent irreversible vibration injury.[9]

Finger blanching is usually triggered by exposure to a humid or cold environment and can be extremely painful. Blanching due to HAVS may only rarely be witnessed by the occupational health professional (Fig. 1).

The phenomenon typically affects the dominant hand first.[10]

5. Neurological injuries

Dentist exposed for many years have a high frequency of neurological symptoms, especially in the dominant hand. The symptoms were comparable to those described in the hand arm vibration syndrome. The neurological symptoms of the dentist have some other pathogenic background than the corresponding symptoms in workers exposed to traditional vibrating tools.[11] In Minnesota (USA), 15 of 61 dental hygienists reported symptoms of tingling, numbness and/or pain in the fingers.[12]

Early symptoms are usually tingling and/or numbness in the hands and fingers.[13] After a while, this turns to impaired sensibility and limited dexterity. Fully developed neurological vibration

Table 1
The Stockholm Workshop classification scale for cold-induced peripheral vascular and sensorineural symptom.[17]

(a) Vascular assessment

Stage	Grade	Description
0	(none)	No attacks
1	Mild	Occasional attacks affecting only the tips of one or more fingers
2	Moderate	Occasional attacks affecting finger tips and middle of the finger (distal and middle phalanges), and rarely affects the parts of the finger close to the palm (proximal phalanges)
3	Severe	Frequent attacks affecting all parts of most fingers (all phalanges)
4	Very Severe	Same symptoms as in stage 3 with skin changes in the finger tips.

(b) Sensorineural assessment

Stage	Symptoms
OSN	Exposed to vibration but no symptoms
1SN	Intermittent numbness, with or without tingling
2SN	Intermittent or persistent numbness, reduced sensory perception
3SN	Intermittent or persistent numbness, reduced tactile discrimination and/or manipulative dexterity