Diseases, Disorders and Injuries

Raynaud's Phenomenon

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What is Raynaud's phenomenon?

Raynaud's phenomenon, sometimes called Raynaud's syndrome or disease, is a disorder of blood circulation in the fingers and toes (and less commonly of the ears, lips, and nose). This condition is aggravated by exposure to cold. When a person has Raynaud's phenomenon, exposure to cold abnormally reduces blood circulation, causing the skin to become pale, waxy-white or purple. The disorder is sometimes called "white finger," "wax finger," or "dead finger."

Raynaud's phenomenon has many different causes, including workplace exposures. Occupationally, it is most commonly associated with "hand-arm vibration syndrome," but it is also involved in other occupational diseases. It is important to know the signs and symptoms of Raynaud's phenomenon and the workplace hazards that cause it. Awareness can help prevent the disorder from occurring or progressing to a serious stage. If not detected in the early stages, the disorder can permanently impair blood circulation in the fingers or toes.

Although Raynaud's phenomenon is not life-threatening, severe cases cause disability and may force workers to leave their jobs. Although rare, severe cases can lead to the breakdown of skin and gangrene. Less severely affected workers sometimes have to change their social activities and work habits to avoid attacks.

Why Raynaud's phenomenon occurs is not well understood. Usually, the body conserves heat by reducing blood circulation to the extremities, particularly the hands and feet. This response uses a complex system of nerves and muscles to control blood flow through the smallest blood vessels in the skin. In people with Raynaud's phenomenon, this control system reacts too strongly to cold temperatures or stress, greatly reducing blood flow in the fingers and toes. Blood flow can also be reduced by adrenaline that is released during times of high stress or anxiety.

What are the signs and symptoms of Raynaud's phenomenon?

Attacks of poor blood circulation in the fingers are the most noticeable symptom of Raynaud's phenomenon. These attacks occur when the hands or the whole body gets cold, either at work or at home or from stress. Household or leisure activities resulting in cold exposure include washing a car, holding a cold steering wheel of a car, or the cold handlebars of a bicycle. Attacks of white finger can also occur when a person is outdoors watching sports or while gardening, fishing or golfing in cold weather.

Typical attacks occur when cold or emotionally upset. Symptoms usually include:

- Cold fingers or toes.
- Tingling and slight loss of feeling or numbness in the fingers, toes, nose, lips, and ears.
- Blanching or whitening of the fingers, usually without affecting the thumb.
- Numb, prickly feeling or stinging pain, sometimes with redness, upon warming or relief of stress.
- A sequence of colour changes in the skin may progress from white to blue to red.

Occupationally induced Raynaud's phenomenon gradually gets worse if workers remain exposed to the condition that causes the problem. As the disorder gets worse, the attacks become stronger and more frequent. It is important to recognize the signs and symptoms in the early stages and to take steps to avoid exposure.

The Stockholm Workshop classification is often used to rate vibration-induced conditions. In this classification, vascular (blood flow) changes and neural (feeling of touch, heat, cold, etc.) changes are considered separately [see Tables 1(a) and 1(b)].

Table 1
The Stockholm Workshop classification scale for peripheral vascular and sensorineural symptoms
(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 also 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 fingertips

(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

Source: Gemne, G., et al. Scandinavian Journal of Work, Environment and Health. Vol. 13, no. 4 (1987). p. 275-278. And: American Conference of Governmental Industrial Hygienists (ACGIH). 2016 TLVs® and BEIs®. p. 190-194 and 198-204.

What causes Raynaud's phenomenon?

The exact cause of Raynaud's phenomenon is not known. Raynaud's phenomenon affects more women than men. Some people have this phenomenon for reasons that cannot be determined. This is called "primary Raynaud's phenomenon". It usually affects both hands equally.

People can also get Raynaud's phenomenon because of certain underlying diseases (e.g., connective tissue diseases such as scleroderma, rheumatoid arthritis, or lupus; diseases of the arteries; carpal tunnel syndrome; certain medications; or smoking) or injuries. This form is known as "secondary Raynaud's phenomenon."

Within the workplace, several hazards can cause secondary Raynaud's phenomenon. Exposure to vibration from power tools is the greatest concern. Hand-held power tools such as chain saws, jackhammers, pneumatic rock drillers and chippers can cause "hand-arm vibration syndrome." This disorder is also known as "vibration-induced white finger," "hand-arm vibration syndrome (HAVS)," or "Raynaud's phenomenon of occupational origin." Raynaud's phenomenon, however, is only one aspect of the hand-arm vibration syndrome. Vibration also damages nerves, muscles, bones and joints of the hand and arm. See the OSH Answers document Vibration – Health Effects for more information.

Before the cancer-causing effects of vinyl chloride were known, workers exposed to high levels of this chemical often experienced Raynaud's phenomenon. Vinyl chloride also causes breakdown of the bones of the fingertips and other health problems. Raynaud's phenomenon from vinyl chloride is now an unlikely occurrence in Canada since exposure to this chemical is controlled much better than in the past.

Raynaud's phenomenon is also seen in typists and professional pianists from repeated finger stress and in dentists and dental technicians. Frostbite injury with damage to the blood vessels can also cause Raynaud's phenomenon.

Other studies have identified Raynaud's phenomenon in workers who injured their hands by using them for hammering, pushing or twisting heavy objects. In these cases, Raynaud's phenomenon was part of a disorder called hypothenar hammer syndrome.

How long does it take for Raynaud's phenomenon to develop?

The time between first contact with the hazardous condition and the appearance of Raynaud's phenomenon is known as the latent period. This time varies according to the type of hazard, the amount of exposure, and the individual worker. Some people are more susceptible than others.

The latent period for vibration exposure can be as short as one year. As a general rule, severe exposure reduces the latent period. If the latent period for a group of workers is short, the disorder tends to appear more frequently. Also, in individuals with a short latent period, Raynaud's phenomenon tends to progress to advanced stages faster.

What workers are at risk of Raynaud's phenomenon?

Raynaud's phenomenon is primarily a concern for workers who handle vibrating tools or equipment such as pneumatic drills, jackhammers, chipping hammers, riveting tools, impact wrenches, pavement-breakers, gasoline-powered chain saws, electric tools, and grinding wheels, especially in pedestal grinders. Any vibrating tool that causes you to feel tingling or numbness in your fingers after 5 minutes of continuous use could lead to Raynaud's phenomenon. Raynaud's phenomenon is also seen in typists and professional pianists from repeated finger stress.

What tests are available for Raynaud's phenomenon?

Several laboratory tests can help determine if a person has Raynaud's phenomenon. Some of these tests measure skin sensitivity or blood flow in the fingers, especially under cooling conditions. However, as of now, none of these tests are universally accepted for detecting Raynaud's phenomenon. These tests, together with careful analysis of an individual's work history and detailed medical history, including signs and symptoms, are useful in judging if a person has Raynaud's phenomenon. Other tests are often performed to rule out other possible underlying causes or to determine if the condition is primary or secondary Raynaud's.

What treatment is available for Raynaud's phenomenon?

Workers with mild cases of vibration-induced Raynaud's phenomenon may recover if the hazard that caused it is avoided. For severe cases, prescribed drugs may reduce the attacks. Treatment aims to reduce the number and severity of attacks and to prevent damage to the fingers and toes. When triggers can be identified, an effective therapy is to avoid further exposure to situations that may trigger an attack. Extra clothing to maintain body temperature, including warm socks and gloves, is essential to keep feet and hands warm. It is also important to find ways to reduce stress, as emotional upsets can trigger an attack.

If detected in the early stages, vibration-induced Raynaud's phenomenon will not worsen as long as there is no further exposure to vibration. Early cases may improve, but advanced cases seldom do. Surgery often reverses Raynaud's phenomenon caused by hypothenar hammer syndrome.

How do you live with Raynaud's phenomenon?

Precautions can be taken to reduce the number and intensity of attacks of white finger. These precautions include the following:

- Protect the body from cold temperatures.
- Dress appropriately for cold weather by wearing layers, mittens, gloves, an overcoat, a hat, and a scarf.
- Avoid exposing your hands to extreme cold -- wear gloves when working in cold water or reaching into a freezer.
- Protect your hands and feet from injury.
- Avoid nicotine - nicotine can reduce blood circulation.
- Decrease stress and anxiety.

- Exercise can increase circulation. Exercise regularly and drink plenty of liquids to prevent dehydration.
- During an attack, warm your fingers and toes (e.g., place hands under armpits or make wide circles (windmills) with your arms, run warm water over your fingers, or soak your feet in a bowl of warm water) and take time to relax.

How can Raynaud's phenomenon be prevented?

Be aware of workplace hazards that cause Raynaud's phenomenon, and take the precautions needed to prevent vibration and cold exposure.

General Precautions

- Protect the hands from damage and extreme temperatures.
- Keep warm at work - wear gloves and warm clothing when working in the cold.
- Massage and exercise your fingers during your breaks.
- If tingling, numbness, or signs of white finger develop, speak to your health care provider.

Precautions with Vibrating Tools

Anti-vibration tools, anti-vibration gloves, and anti-vibration shields may help reduce exposure to vibration.

In general, grinding, machining, and vibrating processes should be as fully automated as possible. Workers should use vibrating tools only when necessary.

There are several ways to reduce the amount of vibration that passes from the tool to the hands.

- Use only well-maintained and properly operating tools.
- Hold vibrating tools as lightly as possible, consistent with safe work practices. Let the tool do the work.
- Rest vibrating tools on a support or work piece as much as possible.
- Store tools so that they do not have cold handles when next used.
- Use proper job design with scheduled breaks to reduce exposure to vibration.

It is important for workers to recognize if early symptoms of Raynaud's phenomenon have occurred and then get appropriate advice to reduce further exposure to vibration.

Are there laws regarding vibration exposure at work?

Canada (federal), British Columbia, Saskatchewan, Manitoba, Quebec, New Brunswick, Yukon, Northwest Territories, and Nunavut are the jurisdictions in Canada that have specifically mentioned vibration exposure within their occupational health and safety regulations in terms of worker health or musculoskeletal effects. Most jurisdictions do not regulate a specific limit to exposure but rather state that workplaces must control for vibration where it can cause health or musculoskeletal effects.

The American Conference of Governmental Industrial Hygienists (ACGIH) has published exposure recommendations for the prevention of hand-arm and whole-body vibration.

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