

Digital gangrene due to hand arm vibration syndrome

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DESCRIPTION

A previously healthy 41-year-old man presented with 3 months history of progressive non-healing digital ulcers and gangrene associated with Raynaud phenomenon. He was a right-handed construction worker who smoked one pack per day for 15 years and regularly used vibrating tools including jackhammers and drills for 20 years. The fingertips had greyish purple discoloration without dermal sclerosis. There were ulcerations and digital gangrene on the right second and fourth fingers ([figure 1](#)). Radial and dorsal pedal pulses were palpable bilaterally. Antinuclear antibody and scleroderma-related antibodies were absent. Thermography revealed decreased temperature of the fingertips of right hand. Chest radiograph and ECG were unremarkable. Thermography revealed low temperature of the fingers of right hand ([figure 2A](#)). Angiography of the right hand demonstrated narrowing of the deep palmar arch, effacement of the superficial palmar arch and decreased blood supply to the fingers ([figure 2B](#)). Hand arm vibration syndrome (HAVS) was diagnosed and he was advised to avoid using an electric drill. Reducing the burden of his

work, smoking cessation and lysozyme hydrochloride ointment improved his ulcers.

HAVS is common among workers with prolonged occupational exposure to industrial machinery that transmits vibration to the hands. HAVS has manifestations of vascular, neurological and musculoskeletal components. Vibration-induced white finger and pain is a common manifestation of vascular component in HAVS and a form of secondary Raynaud's phenomenon. Other differential diagnosis of secondary Raynaud's phenomenon and refractory digital ulcer includes scleroderma, cryoglobulinemia, vasculitis, thoracic outlet syndrome, carpal tunnel syndrome, Buerger's syndrome and peripheral artery diseases.¹ Neurological presentations include digital sensory neuropathy such as tingling, numbness and paresthesia independent of cold exposure. Carpal tunnel syndrome is also noted. Musculoskeletal symptoms manifest as reduced grip strength, osteoarthritis and Dupuytren contracture.¹

In HAVS, endothelial damage and dysregulation of arteries caused by vibration lead to the decrease of endothelial-derived relaxing factors such as nitric oxide and increase of endothelial-derived constricting factors such as endothelin-1. Increased oxidative stress and the predominance of α_2 -receptor function also contribute to local acral dysfunction.²

Several studies reported sensitivity and specificity of thermography in differentiating vibration-induced white finger from healthy controls in which diagnostic ability of thermography is inconsistent. However, Coughlin *et al* reported the sensitivity of 100% and the specificity of 100% if evaluating fingertip and finger base temperatures and their gradient at 7–9 min of rewarming with cold provocation thermography with a water temperature of 5°C for 1 min.³



Figure 1 Digital gangrene on the right index finger and ulceration of right fourth finger.

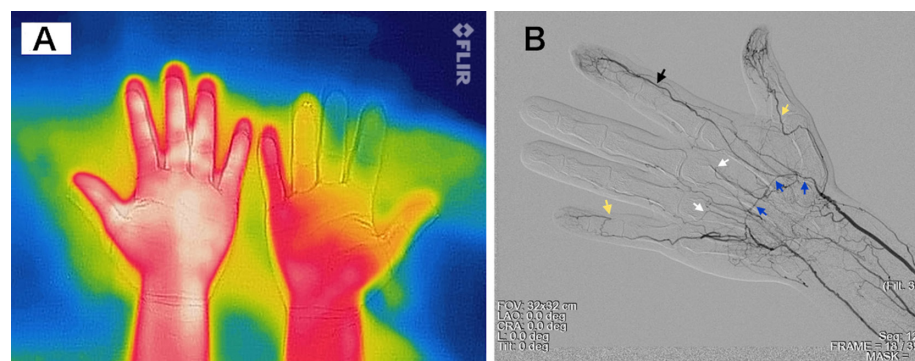


Figure 2 (A) Thermography revealed low temperature of the fingers of right hand. (B). Angiography of the right hand demonstrated following findings: patent radial and ulnar arteries, narrowing of deep palmar arch (blue arrows), effacement of superficial palmar arch, visible proper palmar digital artery of right second finger (black arrow), delayed enhancement with collateral circulation of proper palmar digital artery of first and fifth finger (yellow arrows) and occlusion of common palmar digital artery of third and fourth finger (white arrows).



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Learning points

- ▶ Hand arm vibration syndrome (HAVS) is a form of secondary Raynaud's phenomenon and common among workers with prolonged occupational exposure to industrial machinery that transmits vibration to the hands.
- ▶ In HAVS, digital gangrene and ulcers are a rare complication of prolonged exposure to vibration, caused by endothelial damage and dysregulation of arteries.
- ▶ The management of HAVS includes reduction of vibratory exposure, avoidance of cold exposure, smoking cessation, physical therapy and medical treatment with calcium channel blocker.

Although there is no definite treatment, the management of HAVS comprises reduction of vibratory exposure, avoidance of cold exposure, smoking cessation, physical therapy and medical treatment with calcium channel blocker.¹ Gripping the handle lightly, allowing the machines or equipment do the work for the handler, and rotation of task among several workers may also help to reduce the risk of injury.

Tissue necrosis or ulcers are rare in HAVS¹ but may develop if vibration exposure is not curtailed.

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REFERENCES

- 1 Shen SC, House RA. Hand-Arm vibration syndrome: what family physicians should know. *Can Fam Physician* 2017;63:206–10.
- 2 Stoyneva Z, Lyapina M, Tzvetkov D, *et al*. Current pathophysiological views on vibration-induced Raynaud's phenomenon. *Cardiovasc Res* 2003;57:615–24.
- 3 Mahbub M, Harada N. Review of different quantification methods for the diagnosis of digital vascular abnormalities in hand-arm vibration syndrome. *J Occup Health* 2011;53:241–9.

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