

Use of fluorescence to visualize response to iloprost treatment for frostbite

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A 48-year old man presented to the emergency department in Whitehorse, Yukon, after 8 hours of exposure to -47°C . He was a nonsmoker and otherwise healthy. He had grade 2 frostbite to the left first toe, with cyanosis to the distal interphalangeal joint (Appendix 1, available at www.cmaj.ca/lookup/doi/10.1503/cmaj.202258/tab-related-content). We used intravenous indocyanine green fluorescence, a water-soluble dye, for baseline visual microvascular assessment and to assess treatment response. We started iloprost 0.2 $\mu\text{g}/\text{mL}$ at 10 mL/h and increased it to 50 mL/h for 6 hours daily for 5 days. We captured fluorescence images before iloprost treatment (Figure 1A) and immediately after the first 6-hour infusion (Figure 1B); microvascular perfusion to the affected toe improved. He tolerated treatment well and did not require amputation.

Information on the epidemiology of frostbite injuries is sparse. One nationwide study in Finland reported an incidence of frostbite of 2.5 cases per 100 000 population.¹ Male sex, advancing age and temperatures of -20°C were associated with an increased risk of frostbite.¹ Frostbite injuries range in severity from grade 1 (mild) to 4 (severe, high risk of amputation), and can cause substantial morbidity, including pain, joint stiffness and neuropathic pain.² Although consensus on the standard of care for frostbite management is lacking, many European centres use iloprost for grades 2–4 frostbite, and some also use alteplase for grade 4 injuries.^{3,4} Our institution developed a frostbite management protocol, which includes iloprost infusions daily for 5 days for grades 2–4 frostbite.⁵ Ambulatory patients who tolerate the first infusion may have subsequent infusions as an outpatient.

Intravenous indocyanine green may provide an important means of characterizing patient response to frostbite treatment and optimizing care.⁶ Perfusion is assessed visually by the presence or absence of indocyanine green, using a near-infrared light coupled with a monitor. Comparison of the dye's intensity to surrounding tissues allows a subjective assessment of relative perfusion. Adverse effects are primarily related to allergic reactions, and the only contraindication appears to be iodine allergy.⁷

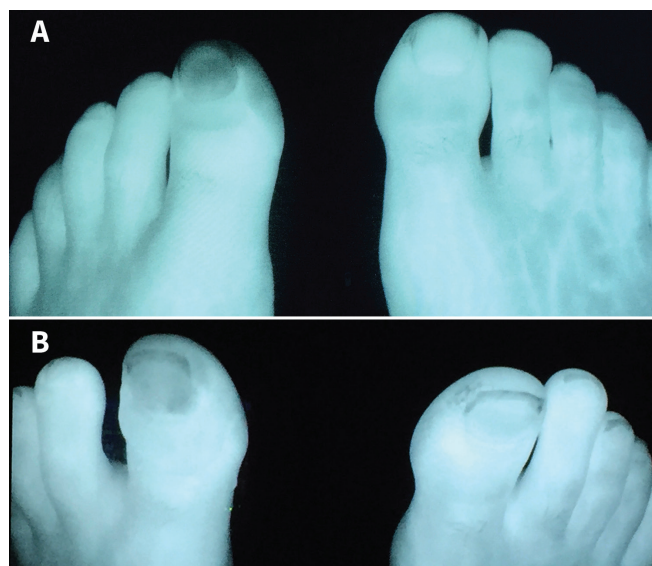


Figure 1: Microvascular assessment of frostbite in the left foot of a 48-year-old man using intravenous indocyanine green. (A) 12 hours after frostbite, before iloprost treatment, with flow defect visible in the distal left first phalanx, compared with uninjured right first phalanx. (B) 6 hours after completion of the first iloprost infusion, with interval improvement of blood flow to the left first phalanx.

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