

Using Low Frequency Nerve Stimulation to “Treat the Cause” in Chronic Venous Insufficiency

This is a brief summary of a presentation given at the annual conference of Wounds Canada, in Mississauga, Ontario, on November 17, 2017. It has been produced with the financial support of Perfuse Medtec Inc. The presenters were Connie Harris, RN ET MSc IIWCC, a consultant in clinical, education and research and a wound care/enterostomal therapy specialist; and Deirdre O’Sullivan-Drombolis BSc PT MCLSc (WH), a physical therapist who practises in Northwestern Ontario and advocates for equal and timely access to effective and efficient care for all.

Chronic Venous Insufficiency: An Overview

Chronic venous insufficiency (CVI) is caused by a complex interplay of several factors, including an abnormal calf-muscle pump, decreased range of motion, decreased muscle strength/activation, incompetent venous valves, neuropathy and decreased mobility. CVI affects the venous system of the lower extremities with venous hypertension, and can cause pain, swelling, edema, skin changes and ulceration.

Treating the Cause

Identifying and treating the cause of a wound is essential to effective wound healing. Because the calf-muscle pump is the force responsible for returning venous blood from the lower extremities back to the heart, abnormal calf-muscle-pump action is a key factor in the development of CVI—so it is something the clinician should always be aware of.

In a normally functioning muscle pump, contraction of the calf muscles expels blood into the proximal col-

lecting vein. During relaxation, the blood is drained from the superficial veins into the deep veins. With a healthy pump, the vein valves are closed during calf-muscle relaxation, preventing backflow of blood due to the force of gravity.

In a leg with an impaired or poorly functioning pump, there is backflow across the valves at rest, and with calf-muscle contraction, blood flows in both directions. This results in ineffective emptying of blood from the calf. A high percentage of patients with CVI have a combination of valve dysfunction and calf-muscle pump insufficiency.

CVI and Wound Healing

Chronic Venous Insufficiency (CVI) is complex and contributes to venous leg ulcers. People with CVI can develop other types of wounds on the legs and feet as well. While CVI may not be the CAUSE of these wounds, it can complicate and prolong their healing.



Helping Patients with CVI

The geko™ device is a type of muscle-pump activator technology that increases blood circulation in a variety of conditions, including CVI. Small electrical impulses stimulate the common peroneal nerve which, in turn, activates the calf- and foot-muscle pumps to return blood to the heart.

Early evidence suggests that the geko™ device, through this stimulation of the common peroneal nerve, can contribute to “treating the cause” by impacting several of the underlying conditions of CVI.

This device can have positive effects on six main facets of treatment. Studies of the geko™ device have demonstrated:

1. **Improved arterial and venous flow volume and velocity.** In patients with intermittent claudication, a recent study¹ demonstrated a 29% increase in arterial flow and a 23% increase in venous flow. In patients with lower limb vascular disease, a 31.5% increase in arterial flow has been reported.²



2. **Improved range of motion.** Patients with chronic veno-lymphedema had increased range of motion in ankle and toes within two weeks of starting treatment.

3. **Improved microcirculation to the wound bed and peri-wound skin.**

4. **Assistance in the reduction of edema.** Figures 1 and 2 show the rapid reduction of edema on a patient with severe chronic veno-lymphedema.
5. It may **reduce symptoms of wound-related pain** associated with CVI, improving tolerance and adherence to compression therapy. Twenty-six percent of patients not in therapeutic compression therapy were able to start or increase compression therapy after using the device to decrease pain.^{3,4}
6. In conjunction with adherence to best practices, it **may increase healing rates** and is suggested for wounds that have failed to reduce in surface area by 30% at 4 weeks.

Part of Care Planning

Clinicians looking to help their patients with venous leg ulcers may consider adding the geko™ device to their toolkit in order to activate the lower-leg- and foot-muscle pumps to increase blood circulation and enhance healing.

For more information, please visit www.gekowound.ca.

References

1. Barnes R, Shahin Y, Tucker A, Chetter I. Haemodynamic augmentation in patients with peripheral arterial disease with the geko™ transcuta-

Leg Measurements (in cm) – geko™ started October 10, 2017						
	October 10, 2017		October 15, 2017		October 23, 2017	
	Right	Left	Right	Left	Right	Left
Above knee	65.0	80.0	64.0	74.5	64.5	70.0
Mid-calf	50.5	60.5	44.0	58.0	48.5	60.5
Ankle	36.0	45.0	30.5	40.0	30.5	40.5
Foot	30.5	36.5	28.0	33.5	28.5	33.5

Figures 1 and 2. Within 10 days of geko™ treatments, with no change to his current compression bandaging system, this patient showed a 10 cm reduction in the measurements above his knee, 5 cm at the malleolus and 3 cm mid-foot.

- neous neuromuscular electrical stimulation device. *International Journal of Surgery*. 2015;18:238e244.
2. Barnes R, Madden LA, Chetter IC. Fibrinolytic effects of peroneal nerve stimulation in patients with lower limb vascular disease. *Blood Coagulation and Fibrinolysis*. 2016;27:275–280.
 3. Harris C, Loney A, Brooke J, et al. Refractory venous leg ulcers: Observational evaluation of innovative new technology. *International Wound Journal*. 2017;14(6):1100–1107.
 4. Harris C, Duong R, Vanderheyden G, et al. Evaluation of a muscle pump-activating device for non-healing venous leg ulcers. *International Wound Journal*. 2017;14(6):1189–1198.

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