Case Report: The role of the geko™, a portable electrical stimulation device, in the treatment of longstanding unilateral leg lymphedema.

Authors:

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Background

This patient is a 47 year old female primary school teacher with an 18.5 year history of secondary lymphedema in her left leg which began during her last pregnancy at age 28. The lymphedema developed slowly and initially MH was prescribed diuretics which worked for a period of time but eventually became ineffective and were discontinued after 9 years. Compression therapy was introduced 17 years ago and MH has undergone massage therapy for the last 10 years. She noticed the most benefit in reduction of leg size with the addition of acupuncture to the massage therapy and has been undergoing this treatment for the last 3 years. She continues to exercise daily and has performed yoga throughout geko™ therapy. MH's quality of life and mobility were affected and she was frustrated at being unable to perform household duties at the end of the working day due to leg fatigue and edema.

As experienced with the diuretics, she stated that all new treatments worked initially then the benefit became less obvious over time. The patient has no other significant medical history. Due to changes in geographical location, MH has been followed by 4 different general practitioners.

MH with an 18.5 year history of secondary lymphedema of the left leg

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The geko™ device

The geko™ device is a small, portable, “one-size-fits-all” neuromuscular electrical stimulation device. By stimulating the common peroneal nerve, the foot and calf muscle pumps are activated once per second by the device. The hypothesis is that the increased venous circulation may support normal physiological lymphatic drainage, in combination with standard compression. When the common peroneal nerve is activated within the popliteal fossa, the calf and foot muscle pumps are activated resulting in increased venous volume and velocity in the lower limb. The portability of the geko™ device enables a person seated or lying down to activate these muscle pumps in a manner similar to that of walking.

The geko™ device therapy

After introducing the geko™ device to MH and receiving her consent it was applied bilaterally starting at 2 hours per day and increased, over time, to 7-8 hours per day to increase blood circulation. Due to significant lymphedema around the knee the geko™ device was placed, following the instructions for use, at the location where MH felt the stimulation of her calf muscle but this was never visible to the eye. The area was marked with an indelible marker for easy daily placement by MH.

The geko™ devices were worn daily on both legs, along with compression on the left leg, for 2 months. During a two week period the patient reported wearing the device for 4 to 6 hours daily while resting at home. MH continued with all of the concomitant therapies described above during the geko™ use. She decided to wear the geko for 4 or 5 days a week and continued to receive the same benefit as when the devices were worn every day. As with each different therapy over the 18 years with lymphedema, MH was initially nervous and skeptical to start something new. She quickly became very comfortable and proficient in applying the geko™ device and wearing it to work each day.

Results

For the first 2 weeks of treatment with the geko™ device at 2 hours day, the patient noticed that the lymphedema affected leg felt softer, especially in the thigh, and that her toes were less swollen. After 3 weeks, the daily usage increase and was wearing the geko™ device 7-8 hours per day. The veins were then visible in her foot and the leg size and shape changed. Four weeks into treatment, the patient reported feeling a better range of motion in her ankle and knee. She also developed dimples in her knee, which she had not noticed in many years. The skin felt softer to touch and a longstanding hard spot on her left lateral thigh disappeared. Her husband noted a change in her gait and a significant change in mood and frustration level.

At the 3 month visit MH stated that she had to tie her shoe laces tighter on her left foot and she no longer need to mark the placement site as she could feel the fibular head for easy placement. She also

reported that she could perform household and family functions such as making dinner or going for a walk at the end of the working day.

Leg and foot measurements were taken and a small visual change was noted after 4 weeks. The most significant improvement appeared 7 cm below the knee where the circumference reduced 3.5cm or 7.9%. (Table 1)

After 6 weeks she noticed a slight skin irritation at the geko™ placement site which she treated with moisturizer in the evenings and continued to wear the device during the day with no adverse effects. MH stated that she felt she had achieved optimal results after 3 months of daily use and decided to wear the geko™ for a few days, stop for a day or two then re-commence. Her objective was quality of life and not necessarily lymph drainage.

Table 1. Measurement Chart

Date	7 cm below knee	Calf, 30 cm from floor	Ankle	Foot
20-Dec-13	44.5 cm	44.5 cm	26.0 cm	24.0 cm
2-Jan-14	43.0 cm	44.0 cm	25.0 cm	23.0 cm
18-Jan-14	43.0 cm	42.5 cm	25.0 cm	23.5 cm
24-Jan-14	43.0 cm	43.0 cm	25.0 cm	23.5 cm
29-Mar-14	41.0 cm	43.0 cm	25.0 cm	23.5 cm
Change	**-3.5 cm**	**-1.5 cm**	**-1.0 cm**	**-0.5 cm**
% Change	**7.9%**	**3.4%**	**3.9%**	**2.1%**

Discussion

Lymphedema is a progressive condition that occurs when the lymphatic system fails to manage the fluids that normally transfer from the blood vessels into the lymphatic system. This fluid accumulation leads to the swelling of subcutaneous tissue. The arterial system continues to function normally and deliver fluid to the tissue. The volume of fluid in the lymphatic system increases until the venous system can no longer compensate for the defective lymph vessels. When drainage has been reduced by 80% or more, symptoms of lymphedema become apparent.

This subject has experienced 18.5 years of marginal or failed therapies as is typical with chronic secondary lymphedema. While the lymphedema affected leg underwent a modest reduction in size

by wearing the geko™ device under compression and along with traditional therapy, these changes appear to have been enough to allow the patient to experience significant changes in her quality of life. The patient felt that the leg was softer and she had better range of motion in her ankle and knee. She felt better and her gait improved. Daily activities became easier to perform at the end of a working day. The geko™ device was found to be simple to use and could be worn for up to 8 hours per day with only minor skin irritation reported as a side-effect. The patient plans to continue wear the geko device every 2 to 3 days, as approved by her family physician and has a goal of being able to fit into blue jeans.

The lymphatic system once compromised is very slow to drain and recover normal physiological function. However, it is hypothesized that the improvement in gait, increased range of motion along with quality of life may allow patients to take greater control of their physical activity with improvement over time.

Conclusions

This patient, with longstanding secondary lymphedema of the left leg, showed measureable reduction in leg diameter following 3 months of geko™ therapy. She experienced symptomatic relief of her longstanding symptoms including less fatigue and improved range of motion in her left knee and ankle. She and her family experienced an improved quality of life.

The subject felt these achievements surpassed any of the previous therapies based on outcome. Volume impact of these changes was not calculated but may have been clinically significant. Further research on the effect of the geko™ device on the venous and lymphatic system in lymphedema subjects is required.

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